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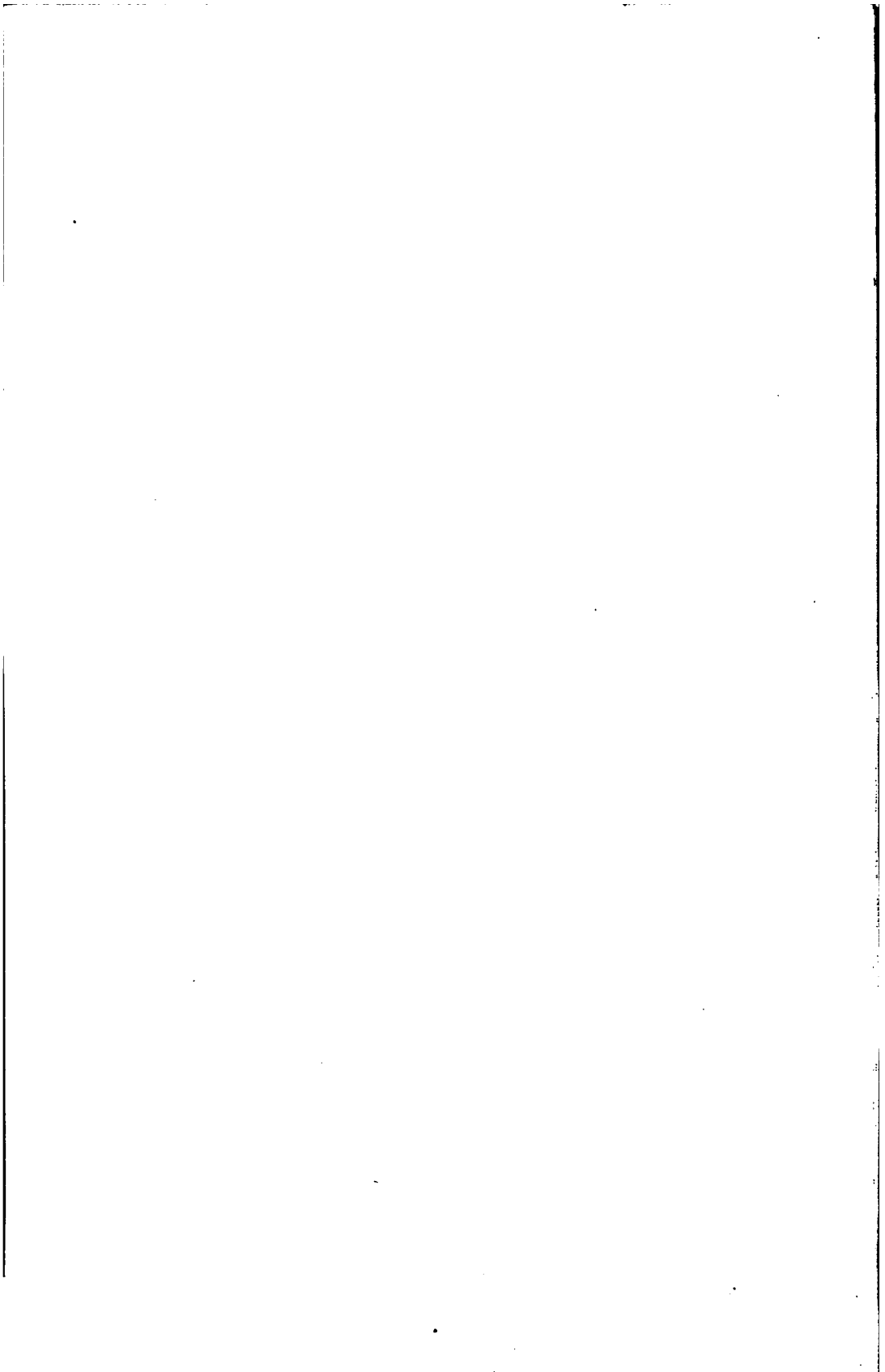
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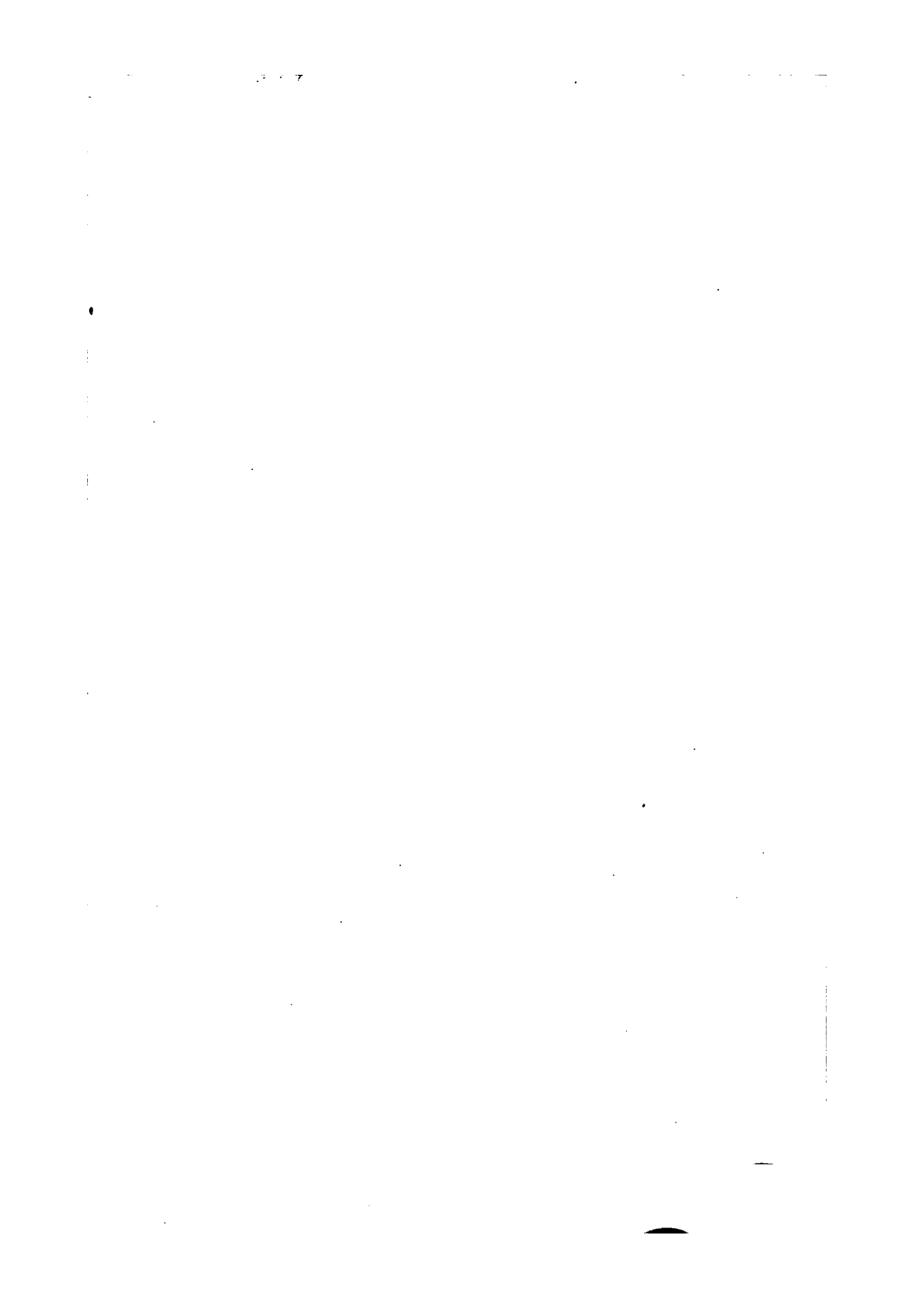


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FIRST
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OF THE

State Road Commission

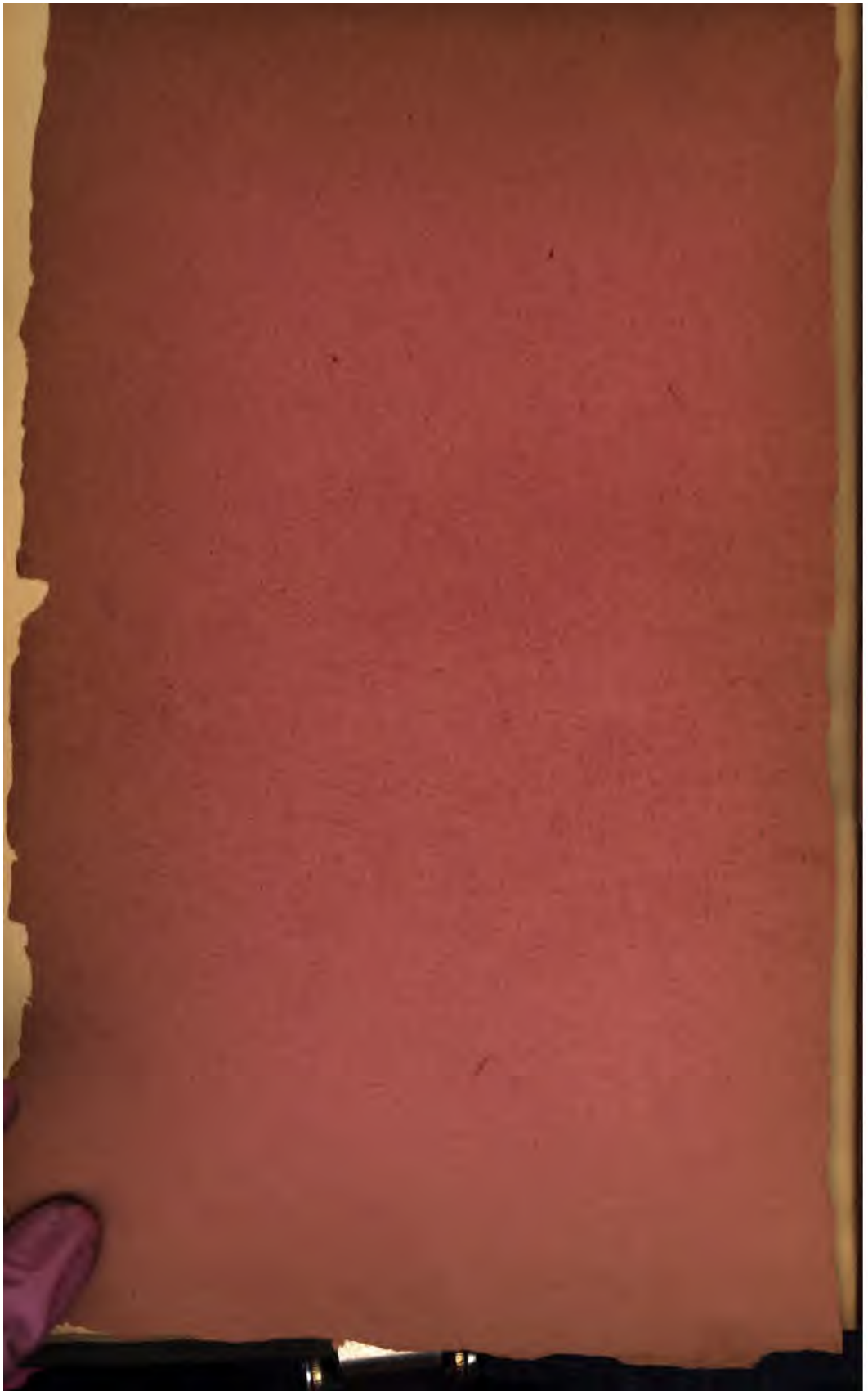
TO THE

GOVERNOR OF UTAH

For the Years 1909 and 1910

1911
Tribune-Reporter Printing Co.
Salt Lake City, Utah

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FIRST
BIENNIAL REPORT

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LETTER OF TRANSMITTAL

WILLIAM SPRY, Chairman.
R. R. LYMAN, Vice-Chairman.
CALEB TANNER, Secretary.
DAVID MATTSON, Commissioner.
J. W. JENSEN, Commissioner.

Salt Lake City, Utah, January 20, 1911.

Honorable William Spry, Governor of Utah.

Sir: In accordance with Section 1, Chapter 119, Session Laws of Utah, 1909, the First Biennial Report of the State Road Commission is herewith submitted.

WILLIAM SPRY, Chairman.
CALEB TANNER, Secretary.

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FIRST BIENNIAL REPORT
OF THE
State Road Commission

STATEMENT OF WORK DONE

The statute providing for a State Road Commission and designating the personnel of same was approved March 23, 1909.

In accordance with the provisions of that law (see Chapter 119, Section 4, Session Laws of Utah, 1909) the Commission on September 15, 1909, made application to each Board of County Commissioners of the several counties of the State to prepare a map showing the location of all of the county roads in such county, map to be made in accordance with the following letter of instruction:

In compliance with Chapter 119, Section 4, Laws of Utah, 1909, you are requested to furnish to the State Road Commission a map of your county, as follows:

- (a) In duplicate.
- (b) On tracing linen.
- (c) On sheet 24 by 30 inches.
- (d) With India ink.
- (e) Neat and legible.
- (f) The scale must be designated.
- (g) The title will be "Road Map of
County."
- (h) "Roads upon which there is most traffic and travel" drawn in red ink.
- (i) All other county roads in green ink.
- (j) Water shall be shown in blue.

In addition to all the county roads in your county, the map shall show all the towns properly designated, and the railroads.

Principal streams and mountains should be sketched in. Great accuracy is not to be used in this detail. In a representative way, however, these physical data are to be shown on the map.

It is suggested that a pantographic reduction of your county map in your recorder's office will serve to yield most of the information required.

If you have no county map, you will obtain considerable assistance from the topographic sheets of the United States Geological Survey covering your county. Your county is partly or wholly covered by the following sheets:and.....

All of the maps of the twenty-seven counties were received by the spring of 1910.

For purposes of administration and supervision, all the counties were arranged under four heads, the northern counties being allotted to J. W. Jensen, the central counties to R. R. Lyman, the eastern counties to David Mattson, and the southern counties to Caleb Tanner.

After covering the field of their several counties, each Commissioner reported for favorable consideration and adoption the county roads in his jurisdiction which should be designated by the Commission as state roads.

Immediately subsequent to the discussion of the state roads in any county, the Commissioner recommended what particular section of the state road in that county should be improved by the available appropriations.

The counties having advanced their quotas as provided by law (see Chapter 119, Section 6, Session Laws of Utah, 1909), and in some cases having provided additional funds, as provided by law (see Chapter 119, Section 7, Session Laws of Utah, 1909,) the State Road Commission, upon recommendation of the Commissioner in immediate charge, designated a local man in each county, either the County Road Commissioner or one having a good local reputation

as a road builder, to supervise the construction work on the State Road according to plans and specifications furnished by the member of the State Road Commission in charge.

Not all of the State roads have as yet been designated. The condition of this phase of the business is shown on the State road map which accompanies this report.

The Commission has, as far as practicable, endeavored to act in harmony with the desires of the local people. Questions of economy, superior construction, avoidance of grave natural obstacles lengthening the State road without compensating advantages, have been the cause of whatever divergence of judgment has arisen between the Road Commission and the local people.

The several breaks shown on the map in order to connect up the State roads thus far designated are due to one or other of these causes.

The counties allotted to the several members of the State Road Commission are as follows:

J. W. JENSEN

Rich, Cache, Box Elder, Morgan, Summit, Tooele and Juab.

R. R. LYMAN.

Salt Lake, Utah, San Pete, Davis, Sevier, Millard and Beaver.

DAVID MATTSON

Weber, Wasatch, Uintah, Carbon, Emery, Grand and San Juan.

CALEB TANNER

Piute, Wayne, Garfield, Kane, Washington and Iron.

RECOMMENDATIONS.

The work of the Road Commission has developed the advisability of modifying the road statutes in some respects:

First. That the annual appropriation be increased from \$27,000 to \$60,000.

Second. That the standard cross-section as contained in the present statute be so modified as to leave this feature of the construction largely discretionary with the Commission. The change in this feature of the law, which is deemed to be advisable by the Road Commission, has also been recommended to the legislature.

In the two years during which the present law has been in operation there has been no practical use made of Chapter 96, Session Laws of Utah, 1909. Legislative recommendations have been made with reference to the use of convict labor, which, in the judgment of the Road Commission, will prove advantageous to the State and will work out with practical success, in which latter feature the present statute is strikingly lacking.

In addition to these recommendations, Vice-Chairman R. R. Lyman submits a statement covering what he deems advisable changes in certain features of the law which are outside of the jurisdiction of the State Road Commission, and in which he also makes reference to some of the subjects covered by the recommendations of the Commission:

POLL TAX.

In the latter part of Section 6, Chapter 118, Laws of Utah, 1909, appears the following: "All Road Poll Tax, except such as is collected by incorporated cities and towns, shall be paid into the county treasury, and shall be expended under the direction and pursuant to the order of the Board of County Commissioners of the County, in making and improving roads." Since the provision has to do with the revenue of the county commissioners, and a portion of this revenue is appropriated annually to be used under the direction of the State Road Commission for constructing the State road, the State Road Commission is therefore more or less interested in this particular provision. For this reason I take the liberty of drawing your attention to some of the facts which have come to my attention concerning the difficulty met with by county road commissioners in some cases when they attempt to collect this tax.

In one county I am told it has in some cases cost the county three dollars for each dollar collected. In some oth-

er cases, men who move about the county more or less give up their employment when they are notified that the poll tax is due. I suggest that a provision be made to the effect that if a poll tax notice is served upon any individual who does not possess a poll tax receipt for the year in which the notice is served, if this individual so notified does not pay the tax, the tax is to be collected by law, and in addition thereto there is also to be collected whatever expense the county is put to to collect this tax. The law should be such in my opinion that delinquent poll tax payers will find it to their interest to pay the tax, even though it requires some effort to locate the place where payments are to be received. As the law stands at present, it appears to be the county road commissioner who is put to a serious inconvenience at the expense of the county. The law should in my opinion make this inconvenience, if any such inconvenience is necessary, fall upon the delinquent tax payer.

There are others who carry and have carried for many years one medical certificate which I have been told even county attorneys hold exempts them from the payment of this tax. Such certificates are presented, I understand, in some instances by men who labor for a livelihood. I suggest that a provision be placed in the law to the effect that a medical certificate which exempts its holder from paying the poll tax must be renewed annually.

CROSS SECTION OF ROADS.

In Chapter 97, Laws of Utah, 1909, standard cross sections for highways of various widths are given in detail. A portion of Section 3 of this Chapter reads as follows: 'The cross section profile of any road where physical conditions will not permit of construction as provided in Section 2 of this Act, the State Engineer shall provide plans and specifications for all permanent construction work in such places.'

In my opinion this provision in Section 3 is not sufficiently broad. The public roads throughout this State vary in width from eight to four rods. According to the standard cross section provided for roads in the law above mentioned, the extreme distance between the edges of the gut-

ters in an 8-rod street is 98 feet. This distance is 88 feet in a 7-rod street, 78 feet in a 6-rod street, 63 feet for a 5-rod street, and 48 feet for a 4-rod street.

While in thickly populated sections it may be necessary to improve roadways to these great widths, so doing is unnecessary, in my opinion, in thinly populated neighborhoods. The construction of the cheapest road under most favorable conditions will be so expensive in most sections of the State of Utah if these cross sections are insisted upon that the cost will positively prohibit making the improvement. Even in Salt Lake City, where the traffic is comparatively great, the policy in many sections of the city has been very wisely adopted of parking many of the broad streets on both sides and in the middle, leaving only two comparatively narrow strips of roadway where roads must be constructed and maintained.

By actual measurement, I have discovered that on the old state road leading through Utah to California, at many places there is only a distance of 10 feet from the edge of the high brush on one side to the high brush on the other side of the road. By actual measurement also in Sanpete County during the past summer, I found that on a recently improved road, the distance from the weeds on one side of the road to those on the other at several points was only 10 feet. If the travel can be accommodated on ten feet of roadway, even if there were in the State treasury or in the county treasury sufficient money to make it possible to construct these roadways 99 feet or even 48 feet in width, I hold that using the money for this purpose would be unjustifiable extravagance.

Again, if the State and county roads are improved to these great widths mentioned, maintaining them by the use of the road grader or the road drag, which are the only feasible methods of maintaining the roads we are able to construct at this time, becomes a serious problem. Two round trips with an ordinary drag will cover well that portion on the average highway in our State over which there is any considerable amount of traffic. To maintain a road 98 feet wide or even 48 feet wide, the widths specified in Chapter 97 above referred to, will require an expenditure of time and money the people of Utah cannot, will not, and

should not afford. In view of these facts, I think it will be well to recommend that the portion of Section 3, Chapter 97 quoted above, be so amended as to authorize the State Engineer or the State Road Commission, with the approval of the State Engineer, to change the standard cross sections named in Chapter 97 whenever in the opinion of the State Road Commission so doing appears to be wise or necessary. While it is not stated in this chapter specifically that it is unlawful to construct a road of any other section than the standard sections provided in this chapter, it does state in Section 7 that "It shall be unlawful to extend or construct any sidewalk so as to encroach upon the highway." I am not sure that constructing a road 30 feet wide, for example, in an 8-rod street, would be interpreted as constructing a sidewalk so as to encroach upon the highway. If so, according to Section 9, the construction of such a road is "declared to be a misdemeanor."

In my opinion it will be well to provide that it shall be unlawful for any county road commissioner to construct any road with a cross section differing from those provided in Chapter 97, or from the cross sections adopted and approved by the State Road Commission. A provision of this sort would make it necessary to have the county roads built in accordance with definite plans, and to grades laid out with reasonable care. As construction is done today, much of it may properly be called patch work.

EXPENSES OF COMMISSION, AND ROAD EXPERT.

The coming legislature should provide funds for paying the expenses of the State Road Commission. The legislature should also make provision for the employment by the State Road Commission of a road expert, whose time should all be devoted to directing the actual construction of roads throughout the State, to the study of road construction and to the preparation of plans and specifications for this construction. While the members of the State Road Commission can reasonably be expected to give careful consideration to all plans and specifications it is proposed to use in constructing the State highway, and to travel throughout the State and keep in comparatively close touch

with the construction of the State road as it progresses, it is not reasonable to expect these men to direct the actual construction in person in the field.

In some of the outlying and smaller counties the experience and training of the county commissioner and county surveyor being necessarily more or less limited, makes it difficult for them to do satisfactory work in road construction without closer supervision and more direct personal assistance than the members of the State Road Commission can possibly give them. I mention this as another reason why the State Road Commission should be furnished with funds and authority for employing a road expert who is to devote all of his time under the direction of the Commission to matters relating to roads and road construction.

My experience has proved to me that perhaps the cheapest man connected with road construction work is a competent surveyor. When roads are built without plans and without the guidance of a surveyor, they are necessarily irregular in grade and poor in alignment. The results in such cases are both unsightly and unsatisfactory. This is a reason why I recommend that it be made unlawful for any county road commissioner to construct a road except in accordance with the cross section provided in the law or approved by the State Road Commission. A provision of this sort would make it necessary for every county road commissioner to have the road laid out in the beginning by a competent surveyor, and also to have elevations taken during the process of construction to see to it that the fills and cuts are made to make the finished road conform with reasonable accuracy with the approved cross section and profile adopted.

TIME TO DO ROAD WORK.

While practically all the road work under the direction of the State Road Commission has been done largely during the past six months, I believe all who have been connected with this work are agreed that very much more can be accomplished if the work is done early in the spring. It was on account of the delay on the part of the county commissioners to furnish road maps promptly that work on the

State highway was not begun earlier. The work on the State roads should begin, in my opinion, this year in the very early spring.

Very respectfully submitted,

(Signed)

RICHARD R. LYMAN."

The reports covering State Road construction accomplished with the funds provided by the legislature of 1909, in each county of the State, is contained in the statement of the member of the State Road Commission for each of the several counties in his jurisdiction, or in the report of the State Agent in charge of the State Road construction for that particular county.

These reports are given herewith, the counties allotted each member of the Road Commission being arranged in succession:

J. W. JENSEN,

Member State Road Commission.

During the past summer State Roads have been designated in the Counties of Cache, Box Elder, Juab, Morgan, Rich, Summit and Tooele, as follows:

Cache: Commencing at the Utah-Idaho line at Cove, thence south to Logan, thence to Wellsville, up Wellsville Canyon to the Box Elder County line, a distance of about thirty-eight miles.

Box Elder: Beginning at the county line in Wellsville Canyon, running thence to Brigham City, thence south to the Weber County line at the Hot Springs. Also, from Brigham City to Corinne, Bear River City, Tremont, Garland, Riverside and Plymouth to the Utah-Idaho line, a distance of about sixty miles.

Juab: Commencing at the Utah-Juab County line, south of Payson, running thence to Nephi, Levan, thence to Millard County. Also from Nephi east to the Juab-San Pete County line, a distance of about fifty-eight miles.

Morgan: Commencing at the Weber-Morgan County line in Weber Canyon near Devil's Slide, running thence

easterly through the county to the Morgan-Summit County line near Echo, a distance of about thirty miles.

Summit: Commencing at the county line near Echo, thence to Coalville, Huntsville, Rockport and Kamas, also from Kamas to Park City and Gogorza to the Salt Lake County line, a distance of about sixty miles.

Rich: Commencing at the Utah-Idaho line near Garden City, running thence to Laketown, Randolph, Argyle, Woodruff to the Utah-Wyoming line between Woodruff, Utah, and Evanston, Wyoming, a distance of about forty-five miles.

Tooele: Commencing at the Salt Lake-Tooele County line near Garfield, running thence to Erda, Tooele, Stockton (over Johnston Pass leading to Nevada), a distance of about fifty miles.

Road construction, in the above named counties, has been in accordance with the plans and specifications which follow.

SPECIFICATIONS FOR THE CONSTRUCTION OF
STATE ROADS IN CACHE, BOX ELDER,
TOOELE, JUAB, SUMMIT, MORGAN,
AND RICH COUNTIES.

(1)

WORK STAKED OUT.

Previous to the commencement of the work of grading and gravelling the roads the work to be done is to be staked out by the County Surveyor or such other competent person as may be designated. The following lines of stakes are to be set:

One center line of stakes forming the center line of the road shall follow as nearly as possible the center of the right of way of the State road, said line of stakes to make only such curves as may be required by the change in the general direction of the road. Small crooks or bends on a road where the right of way does not

change direction are to be entirely eliminated. This center line of stakes is to form the initial point of measurement for the location of the cross sectional profile. Said stakes are to be driven to a point which is 16 inches above the road bed, this being the depth of surfacing at the center of the road.

At a point on either side of the center line and 7 feet distant are to be driven stakes on a point 11 inches above the road bed. At a point on either side of the center line 21 feet distant on the level ground stakes are to be driven giving the cut necessary to accomplish the drainage as outlined in the cross section profile, which would be a cut of two feet on level ground. (The distance these stakes are to be placed from the center line will necessarily vary where the road is not level, the distance being such as will make the outside of the drainage ditch 19 feet from the center line, the side slopes of the cuts on either side being 1 foot horizontal to 1 foot vertical.

In cases where the surface of the ground has a considerable slope at right angles to the axis of the road it may be undesirable to attempt to make the road bed level. In such cases the crown of the road should be maintained as given in the cross sectional profile. The upper drainage ditch, however, must be made sufficiently deep to prevent any water getting into the road from the uphill side, the drainage ditch to be made sufficiently large to conduct such water along the side of the road to such a point that it can be conducted under the road through a culvert.)

(2)

PREPARATION OF THE ROAD BED.

The stability, permanence and maintenance of any pavement depends upon its foundation, therefore the following essentials necessary to the forming of a good foundation should be obtained as far as practicable with the conditions at hand. First, the entire removal of all vegetable, perishable and yielding matter. Second, the drainage of the subsoil whenever necessary, as a permanent foundation ~~can~~ only be secured by keeping it dry. Third, the tho

compacting of the natural soil with a heavy roller wherever such compacting is necessary.

In preparing the road bed for the gravel surfacing to be used, all small undulations now existing in the road should be eliminated so as to permit of a surfacing of uniform thickness which will give when completed a uniform surface in the direction of the road. (The purpose of the above specification is to do away with the undulating conditions which are so commonly found on our public roads, whereas a slight cutting on the high places and the filling in of the removed material in the low places will give a uniform road bed for the surfacing material.)

The drainage ditches and grading should be accomplished before the work of graveling the road is commenced. The material which is excavated for the drainage ditches and to a point 3 feet 10 inches inside of the inner edge of the drainage ditch, is to be placed in an embankment to the top of the stakes which are 7 feet from the center line, this surface being brought to a uniform slope as shown in the cross sectional profile, the embankment material to serve in holding the gravel which is to be placed upon the road later in position.

The embankment material forming the abutments for the gravel in the center and the earth roads on each side of the graveled center is to be thoroughly sprinkled and rolled during construction. Any excess of material from the drainage ditches may be used in the making of the road bed uniform.

The longitudinal grade on roads which are not mountainous roads should not exceed four per cent.

On parts of the road where a natural road bed exists and good road material is present, the road may be constructed by simply making the road conform to the cross sectional profile by using the material obtained from the drainage ditches and sides of the road for the entire center filling. Where this is done care must be taken to see that all gravel or more than one inch to one and one-half inches in diameter should not be placed on the surface covering of the road.

(3)

DRAINAGE.

In all cases the drainage ditches are to be given a slope in the direction of the axis of the road so that the water that may enter said drainage ditches will be readily conducted to the low places where it may be carried from the road. The maximum slope of said drainage ditches should not exceed 2 feet per hundred feet. The minimum slope that should be given these drainage ditches is 2-10 of a foot per hundred feet. The cross section of said drainage ditches as given in the cross sectional profile is one foot bottom and side slopes of one foot vertical to one foot horizontal.

(4)

CULVERTS.

Culverts are to be placed at all points necessary for the conducting of drainage water under the road and for the conducting of irrigation water or stream crossing the road. Said culverts should be made a permanent construction. Concrete should be used for all culverts of any considerable size where the cost of cement and concrete material is not prohibitive. Where metal culverts of 12 to 16 inches in diameter will materially reduce the cost of construction such culverts may be used. The mixture to be used in the concrete for the concrete culverts is to be one part cement (a good Portland brand), $2\frac{1}{2}$ parts good clean sharp sand and five parts of clean gravel, largest gravel not to exceed $2\frac{1}{2}$ inches in diameter.

All culverts must be so placed with respect to the surface of the road that there may be at least six inches of surfacing material placed on the culverts to bring said road bed to the grade of approaches from either direction, thus making it impossible to have the undesirable condition of jolts in passing over culverts.

Culverts should be 34 feet long so as to leave the total width of road inside of drainage ditches available for use by traffic and culverts should have a fall of 5-10 of a foot in their length.

The road may be given a slight grade on either side of the culverts for a distance of about one hundred feet where necessary, to obtain the above conditions. In all cases where conditions will permit, the culverts are to be made sufficiently low to permit of the above condition without changing the grade of the surface of the road.

Whenever concrete culverts are used they should be neatly formed and in cases where the span of the culverts exceed three feet the concrete should be reinforced with expanded metal. In culverts where the span is, say $2\frac{1}{2}$ to 5 feet, the arch of the culvert should have a rise of from 1 to $1\frac{1}{2}$ feet and a thickness at the crown or top of the culvert of about 1 foot thickness, same to be reinforced with expanded metal. If larger culverts than the above sizes are desired, requests for special design of culverts should be made.

(5)

BRIDGES.

The matter of supplying bridges in any part of the road to be improved should be taken up with the State Road Commissioner in charge of the precinct where road construction is being made. In all cases where money from the State Road Building Fund is to be used in the construction of bridges, it will be necessary that such bridges be constructed either of expanded metal, concrete or steel, depending entirely upon the span and conditions attending each structure.

(6)

SURFACING MATERIAL.

The material to be used in building the center fourteen feet of road is to be gravel or broken stone (broken stone to be preferred wherever machinery is available for the crushing of the stone.) In selecting gravel for this purpose the chief quality to be sought for is the property of binding. The binding properties are: First, the presence of ferruginous clay which causes the gravel to set or become hard as soon as it is exposed to the action of the atmosphere; second, the angular shapes and sizes of the stones. The gravel should be clean, that is, free from all animal

or vegetable matter and containing not more than fifteen to twenty per cent of loam or sand and clay. The gravel or broken stone to be used in the road is to be carefully screened into two grades, the finer or surfacing grade to be only such gravel as will pass through a seive of a one inch diameter mesh. The foundation layer should be of gravel of the above quality, the largest stones of which are not to exceed three inches in diameter.

The gravel is to be placed on the road in the following manner: The coarse material to a depth of 10 inches at the center of the road and about 5 inches in depth at a point 7 feet on each side of the center, the said layer of coarse gravel to be uniformly spread over the whole width, then compacting with a roller weighing not less than one ton per foot of length. The rolling should be continued until the pebbles cease to rise or creep in front of the roller. The surface must be moistened by sprinkling in advance of the roller, but too much water must not be used. The top layer which is to be of the fine gravel, which is to be uniformly spread over the center 14 feet of roadway to a depth of 6 inches is to be treated in the same manner as the foundation layer.

(7)

WATERING TROUGHS.

Whenever water can be secured to supply water for a watering trough it is desirable to place a concrete watering trough at intervals of about ten miles along the road. The outlines and drawings for such troughs will be furnished upon application.

(8)

TIME CONSTITUTING A DAY'S WORK.

The length of a day is to be eight hours actual work. None of this time is to be used in going to or from the work, hitching up or unhitching teams.

20

(9)

PRICE TO BE PAID.

For man and team, to be three and 50-100ths (\$3.50) dollars per day. Price for single men not to exceed two (\$2.00) dollars per day.

(10)

DUMP BOARDS.

Dump boards are to be furnished with teams and are to be of the following form: Made from two inch plank; sideboards to extend down to bolsters of the wagon, are to be 20 inches high and 12 feet long, the bottom plank to be of 2x6 material and at least 12 feet long; and gates to be 18 inches high and to be placed 10½ feet apart.

Teams employed in road construction are to travel on the road being built.

(11)

LOADING GRAVEL.

Provision is being made for the loading of gravel by means of a dump trap which will make the loads of gravel hauled of uniform size and will secure the loading of teams without delay.

Plans and specifications necessary for the construction of these traps for screening and loading the gravel will be furnished parties having the road in charge, at an early date.

(12)

COMMENCEMENT OF WORK.

The work of road construction should be commenced at once and be prosecuted with such force and diligence as conditions will permit until the funds available in each county have been expended.

(13)

NOT RESPONSIBLE FOR INJURY.

The Road Commissioner in charge of the road improvements in each county will not be responsible for injury

to persons, horses or property that might occur in the performance of said work.

(14)

DISMISSAL OF INCOMPETENT OR UNDESIRABLE HELP.

The Road Commissioner in charge of said road improvement is empowered and requested to dismiss any and all incompetent or undesirable help.

(15)

CLEANING UP.

Before leaving any part of the road which is being improved, all rubbish and unsightly material including stones, and gravel of more than 1½ inches in diameter, are to be removed from the roadway.

(16)

OMISSIONS IN SPECIFICATIONS.

Whenever conditions may arise which need additions to the above specifications in order to protect the best interests of the State in the said road construction, such specifications may be added from time to time as occasion demands.

ROADS CONSTRUCTED.

About two and one-quarter miles of road has been constructed in Cache County at a cost of about \$2,500 per mile. This part of the road represents about the most expensive piece of construction in the County.

In Box Elder County about four miles of road has been graded ready for surfacing with broken stone. The surfacing is underway at present about three-fourths of a mile has already been surfaced.

The cost of grading has been approximately \$1,000 per mile. The broken stone surfacing will cost about \$1,000

per mile. The Stone Crusher is run by a steam engine and the screened broken stone is hauled onto the roads in dump wagons with a traction steam engine.

It is believed that this will make a first class road. Box Elder County is the best equipped county in my district for road construction. About four miles of road grading has been accomplished in Juab County and about three-fourths of a mile of road graveled at a total cost of about \$4,200. The grading cost approximately \$800 per mile and the graveled about \$1,000 per mile.

In Morgan County about two miles of road has been improved including two steel bridges, one a fifty-foot span and the other a twenty foot span.

In Summit County one and one-fourth miles of road was constructed at a cost of about \$3,500, about one-third of a mile of this road was in rock which had to be blasted, thus making it rather expensive.

In Rich County about four miles of road have been improved, including two steel bridges, one a twenty and the other a thirty foot span, costing in all \$6,400.

A report has not yet been received from Tooele County.

The following table shows the amount of money for State Road improvement in the different counties and the source from which the money was derived:

County	Money from State	Money from County	Money from Special Tax	Total
Cache	\$ 2,000	\$ 2,000	\$ 5,800	\$ 9,800
Box Elder	2,000	2,000	3,500	7,500
Tooele	2,000	2,000	3,000	7,000
Juab	2,000	2,000	.....	4,000
Summit	2,000	2,000	.....	4,000
Morgan	2,000	500	1,000	3,500
Rich	2,000	500	3,900	6,400
Totals	\$14,000	\$11,000	\$17,200	\$42,200

Assuming that Tooele County has improved three and one-half miles, then the total distance improved in the above seven counties is twenty-one miles at a total cost of \$42,200, or a unit cost of approximately \$2,000 per mile.



ROCK CRUSHING PLANT, BOX ELDER COUNTY

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The total number of miles of State Roads designated in the above seven counties is about three hundred and forty miles.

At the above rate of improvement thirty-three years will be required to cover the roads already designated, and as our method of construction is for the most part only temporary, the roads constructed now unless a large amount of money is expended for maintenance, will be worn out and unfit for use. Therefore, in order to accomplish results in the good road movement in this generation, more money must be secured. This money must come, if at all, from the tax payers of the State; we cannot hope for others to build roads for us, we must do it for ourselves.

How often do we hear the statement, "The two greatest interests in our State are first Education and second Good Roads." If this is true that the cause of good roads can be put in the same class as education, are we not neglecting an important interest of the State?

During the last session of the Legislature about five and one-half mills was appropriated for school purposes, and a little more than one-eighth of one mill was appropriated for good roads; approximately, the same ratio exists in the county expenditures.

Should the two interests be compared from the viewpoint of the number of persons engaged in the work of each, the contrast would be even more striking.

Furthermore, if the improvement of roads in this State is of such importance as it is generally believed to be, is it not time some person or persons should be appointed whose business it shall be to see that this important interest is not neglected or lost sight of altogether?

Is it not possible for this State to appropriate the equivalent of one mill annually for the construction of State Roads; this amount to be distributed among the different counties in accordance with the present law, each county being required to pay their proportional amount in accordance with the present law? These two sources and the source of special taxation to the extent of five mills in each precinct where road construction is made, would

give a fund which would permit of a fair rate of construction. At this rate the three hundred forty miles of State Road already designated in the seven counties named could be improved in five or six years. If more funds were available the necessary machinery for good and economical construction could be obtained, thus making it possible to secure a dollar's worth of work for every dollar expended, which is impossible under the present method.

Permit me to call attention to what is being done in other states. New Jersey started aiding road construction with \$50,000 two years ago. New Jersey spent \$700,000 for care and maintenance of roads.

New York first appropriated \$50,000 for road purposes; since, New York has appropriated as much as \$50,000,000 for highways.

Pennsylvania has increased her appropriation from \$150,000 to \$6,000,000 for roads.

Connecticut started with an appropriation of \$75,000 which has grown to \$4,500,000.

Salt Lake City has expended during the last year nearly double the amount appropriated by the last State Legislature for the entire State of Utah for a period of two years.

I cannot urge too strongly the necessity of more money for road construction.

Respectfully submitted,

(Signed)

J. W. JENSEN.

R. R. LYMAN,

Member State Road Commission.

Dear Sir:

The following is a report of the work done on the state road in the seven counties in which, under the direction of the State Road Commission, I have had general charge.

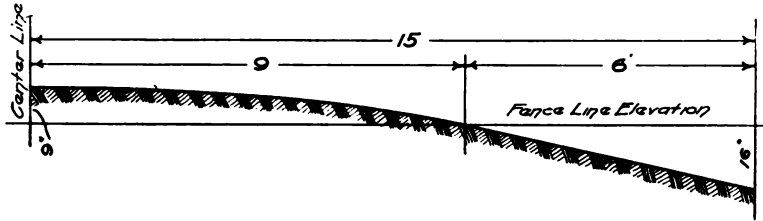


FIG. 1. CROSS SECTION APPROVED BY STATE ROAD COMMISSION FOR EARTH ROAD IN DAVIS COUNTY. THIS CROSS SECTION ALSO USED IN UTAH, SANPETE, SEVIER, MILLARD AND BEAVER COUNTIES.

Fig. 1 shows a cross section prepared especially for the State road in Davis County, the same having been approved by the State Road Commission. This same cross section, with only occasional variations has also been used for the portion of the state road that has been built in Utah, San Pete, Sevier, Millard and Beaver Counties, while the cross section used in Salt Lake County is practically the same as that given in the state law for a 7-rod street.

Those who have attempted to build a road in conformity with the cross section shown in Fig. 1 have succeeded fairly well in making the crown of the road 25 inches higher than the bottom of the gutter, but the grade between these two points has been made somewhat more nearly uniform generally than that shown in the cross section. With a uniform slope this cross section has a fall from the center of the road to the bottom of the gutter of 1 2-3 inches per foot, while the slope which experience has proved to be best for a road of this character is not more than one inch per foot. If the road is built, however, in strict accordance with the cross section as given, it has a slope in the 6 feet on either side of the road of 2 2-3 inches per foot, while the travelled portion of the road, 9 feet on either side of the center, or 18 feet altogether, has a slope of 1 inch per foot.

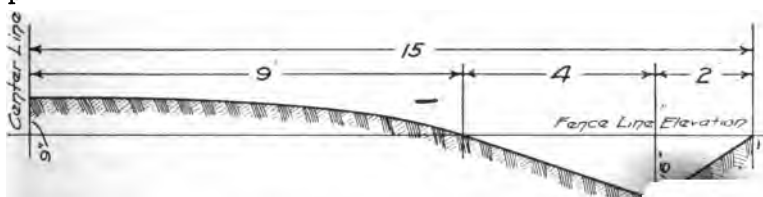


FIG. 2. SUGGESTED CHANGE IN CROSS SECTION SHO

If the cross section of this road were changed to that shown in Fig. 2, the work could still be done with a road grader. While it is convenient to leave the outside edge of the drain ditch vertical, and its appearance in the beginning is not generally objectionable, this vertical bank 16 inches high is broken down more or less in the course of time and then it naturally presents a somewhat uneven and unsightly appearance. The section proposed in Fig. 2 will not only remain as it is constructed, but it will also have the additional advantage that wagons can cross it at points where roadways lead into private property, or wherever else so doing may be either desirable or necessary.

Figures 3 and 4 different portions of the sand-clay road constructed in the northern part of Davis County, between Salt Lake City and Ogden. The cost of this road, which is given below, indicates that perhaps the cuts and fills made in order to give the road a comparatively uniform grade in a longitudinal direction were made somewhat greater than the conditions of the country really warrant.

At one place along the line a cut was made with a maximum depth of 3 feet, the same decreasing, however, somewhat uniformly in both directions. The total length of this cut was about 500 feet. A fill averaging a height of 2 feet was made on another portion of the road for a distance of about 600 feet, while a cut averaging about one foot was made in another place for a distance of about 800 feet. The maximum grade of the finished construction is 0.61 per cent. The minimum grade is 0.20 per cent. While the finished road with the comparatively long stretches of uniform grade has a pleasing appearance, the cost of securing this grade may be somewhat too great to justify such construction.

The portion of the Davis County road shown in Figures 3 and 4 was carefully laid out and cross sectioned. The work of construction was done under the direction of a man who had had experience building earthwork to grade. The result as seen in the picture is very satisfactory.

Figures 5 and 6 are pictures of a portion of the state road north of Ephraim, in San Pete County. These roads have both been well maintained by the use of the split-log

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FIG. 3. PORTION OF SAND CLAY ROAD IN NORTH-
ERN PART OF DAVIS COUNTY.



FIG. 4. PORTION OF SAND CLAY ROAD IN NORTH-
ERN PART OF DAVIS COUNTY.



FIG. 5. ROAD NORTH OF EPHRAIM, IN SANPETE COUNTY, SHOWING LARGE WEEDS GROWING ON EITHER SIDE OF THE ROAD IN ONE YEAR AFTER ROAD IS CONSTRUCTED.



FIG. 6. ROAD IN SANPETE COUNTY, SHOWING SMALL WEEDS GROWING CLOSE TO EITHER SIDE OF THE TRAVELED WAY IN A FEW MONTHS AFTER THE ROAD IS BUILT.

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drag. The road shown in Fig. 5 was constructed during the summer of 1909. The edges of the weeds seen where the two men are standing in a portion of the well-travelled highways are only 10 feet apart. The road shown in Fig. 6 was constructed during the summer of 1910. The picture taken in the fall of this same year shows that weeds were growing on either side of the travelled highway. The distance between the weeds on one side of the travelled roadway to those on the other is in many places only 10 feet. This indicates that in sections of the country where the amount of travel is limited it is unnecessary to construct and maintain roads wider than from 20 to 30 feet.

Figure 7, looking north from Ephraim toward Mt. Pleasant in San Pete County, shows a road constructed in 1909. This road occupies practically the whole street. The material needed for sidewalks has been removed and in place of the sidewalk a borrow pit is seen in the right hand side of the picture, while a gutter filled with water is shown in the left. It is seen also in this picture that only a very small portion of the constructed roadway is used for travel.

Figure 8, taken looking north toward Moroni in San Pete County, shows how a portion of a roadway may be improved while the sidewalks and the irrigating ditch may be left in good condition and undisturbed.

Figure 9 is a picture of a portion of the state road seen looking north toward Fountain Green in San Pete County. The road has swamps on either side of it. Pools of water can be seen in the picture, also straw and other material used to make it possible for teams to cross this mire.

In Figure 10 may be seen the same piece of road after it has been improved under the direction of the State Road Commission. The split-log drag used for maintaining this road is shown in the central portion of the picture.

Figure 11 gives a better view of the road drag, and shows more clearly how free the surface of this road is from holes and ruts.

In Figure 12 may be seen a concrete culvert recently constructed near Spring City to replace an old wooden one

which had been a source of serious trouble for years during the high water season. The people of Spring City contributed half of the time and labor required for making this construction. The work done included not only the replacing of the culvert, but also the cutting down of the steep hill shown in the picture. The deep cut and the corresponding high fill over the culvert together have greatly improved the grade of the road in this neighborhood.

In Figure 13 is shown a portion of the road in Chester in Sanpete County, where the grading and the dragging of the roads has been done entirely by donation on the part of the citizens. The county commissioners have furnished the grader and also the road drag used in constructing and maintaining the roads in Chester.

Figure 14 shows a road with a smooth surface constructed; however, as the road supervisor himself says, without any thought as to the cross section of the gutters or either the alignment or the grade of the road. "I never noticed before," said he, "that this road is not straight and that its grade is not uniform."

IMPROVEMENTS IN BEAVER COUNTY.

Report of Mr. August Thiessen, County Road Commissioner of Beaver County, and State Agent:

Construction work began 4,675 feet southeast of the corporate limits of the town of Milford. 5.673 miles of road has been laid out and the construction on the same has been completed. Of this road the first 0.892 mile has been graded and a strip of gravel 12 feet wide and 8 inches deep has been placed upon the surface. The cost of the completed road was \$1,243.58 which is at the rate of about \$1,400.00 per mile. The cost of hauling and spreading the gravel was about \$1,200.00 per mile, while the cost of grading was roughly \$200.00 per mile. The total width of the improved road on which this gravel was placed is 50 feet. While it had been partly graded previously the road was

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FIG. 7. OLD ROAD IN SANPETE COUNTY SHOWING RESULTS OF CONSTRUCTING A WIDE ROAD.



FIG. 8. ROAD SCENE LOOKING NORTH TOWARD MORONI, SHOWING THE ADVANTAGE OF USING ONLY A PORTION OF THE STREET FOR ROADWAY



FIG. 9. LOOKING NORTH TOWARD FOUNTAIN GREEN. THE PICTURE SHOWS A PORTION OF THE STATE ROAD JUST BEFORE THE WORK OF CONSTRUCTION WAS BEGUN IN THE SUMMER OF 1910



FIG. 10. SAME AS FIG. 9, AFTER WORK OF CONSTRUCTION WAS COMPLETED. SHOWS SPLIT LOG DRAG IN OPERATION

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in a badly washed condition, and therefore the cost of grading was unusually high.

The next 2.038 miles of road has been simply graded. The western mile of this graded road is through a bed of alkali. It has been dragged four times with the split-log drag, and at present, December 5, 1910, has a firm and even surface. It is proposed on this mile of road to demonstrate whether or not a road of this material can by proper maintenance be kept in fairly good condition without having its surface covered with gravel.

The remaining portion of this 2.038 miles of road is through a soil composed of sandy loam. The surface of the road which has a width of 30 feet is firm and even.

All of the grading on the portion of the road above mentioned has been done largely with a road grader. The remaining 1.586 miles of improved road was made over a rough and sidling country. The soil contains a large amount of loose rock, and running approximately at right angles to the direction of the road are a great many large washes. Through this section of the country cuts were made through the high places and fills were made in the low places, bringing these points to the grade specified upon the profile before the road grader was used for throwing the material into the form required by the cross section 30 feet wide adopted by the State Road Commission.

In the last named section of this improved road twelve corrugated galvanized steel culverts 12 inches in diameter were used, and also three culverts made of the same material 18 inches in diameter.

The following table gives the details concerning the construction of this road:

Character of Ground	Surfacing Material	Length of Road in Miles	Width of Road in Feet	Grade	Approximate Cost per Mile	Total Cost
Alkali Clay	Gravel	0.892	50	0.8%	\$1,394.00	\$1,243.58
Alkali Clay and Sandy Loam	None	2.038	30	0.8%	204.00	416.26
Sandy Loam	None	0.887	30	0.87%	204.00	181.16
Rocky, Uneven	None	1.856	30	1.58% and 0.14%	447.00	829.00
Totals		5.673				\$2,670.00

The road named in the above table which has a surfacing material of gravel had its central portion 12 feet in width covered with gravel to a depth of 8 inches. This surfacing material was hauled about one-quarter of a mile. The wagons in which the material was hauled were loaded with teams and tongue scrapers.

Some further work has been done in Beaver County since the above report was made.

IMPROVEMENTS IN DAVIS COUNTY.

Report of Mr. Charles T. Bennett, County Road Commissioner and State Agent in Davis County:

The road construction in Davis County was made through a section of deep heavy sand. On the northern portion of this improved road gravelly soil, which had to be hauled for a distance of about one and one-quarter miles, was used for a surfacing material. On the southern portion of the road, clay, hauled for a distance of about one-half mile, was used for a surfacing material. These two surfacing materials were placed on the road to a depth of about 8 inches. The traveled portion of the road is covered with this surfacing material to a width of from 18 to 24 feet.

No culverts whatever were used under the road in this sandy district. Two teams and two men were employed constantly running a sprinkler over the road during the process of construction. It was necessary to use two men to pump the water into the sprinkling wagon.

The main portion of this improved road has been dragged three times. The cost to Davis County for dragging this road is about \$1.50 per mile for each dragging of two rounds. When this dragging can be done on a well established basis its cost will probably be less. Had the construction work in Davis County been done in the spring the plowing would have required but one team instead of two, while sprinkling the road during construction would not have been necessary.

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FIG. 11. CLOSE VIEW OF ROAD SHOWN IN FIGS. 9 AND 10, AND ALSO OF ROAD DRAG



FIG. 12. CONCRETE CULVERT NEAR SPRING CITY. CITIZENS CONTRIBUTED HALF THE COST OF DOING THE WORK, WHICH INCLUDED MAKING THE DEEP CUT AND A CORRESPONDINGLY HIGH FILL OVER THE CULVERT



FIG. 13. ROAD IN CHESTER WHERE CITIZENS CONTRIBUTED ALL THE LABOR FOR CONSTRUCTING AND MAINTAINING MANY MILES OF HIGHWAY



FIG. 14. ROAD NOT STRAIGHT, GRADE NOT UNIFORM, AND CROSS SECTION OF DRAIN DITCHES NOT CONSTANT. ALL THESE CONDITIONS COULD HAVE BEEN GREATLY IMPROVED WITH VERY LITTLE ADDITIONAL COST

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The present method of constructing a road to a width of about 30 feet, thus leaving sidewalks undisturbed on either side of the street, is a much better method of road construction than that formerly used.

The work of construction on the State road in Davis County was begun at Station 40, which is 4,000 feet south of the north boundary line of Davis County, and it was completed to Station 91, which point is 9,100 feet south of the north boundary line of Davis County.

Figures 3 and 4, previously shown, are pictures of the above described portion of the State road through Davis County.

Another portion of road improvement made in Davis County covered a distance of 1,100 feet on what is known as Secrist Hill. Slightly more than one-half of this improvement is in Section 11, and the remaining portion in Section 12, Township 3 North, Range 1 West, Salt Lake Base and Meridian.

The maximum cut made on the Secrist Hill was about 8 feet, and the maximum fill in the road south of the hill, about 9 feet. The cut was made 20 feet wide in the bottom. The top of the fill and the bottom of the cut were both covered with a surfacing material of gravelly soil 20 feet wide and 8 inches deep.

The cross section shown in Figure 1 was prepared especially for the road in Davis County. A short section of road was made in the beginning 45 feet wide, and another section was constructed 35 feet wide, before it was finally decided to make the construction with a width of only 30 feet.

The following table briefly summarizes the work in Davis County.

Character of Ground	Surfacing Material	Length of Road in Miles	Width of Road in ft.	Approximate Cost per Mile	Total Cost
Sand	Gravelly Soil	0.965	30	\$3,580.00	\$3,442.58
Earth, Cut and Fill	Gravelly Soil	0.208	20	5,450.00	1,136.02
Totals		1.173			\$4,578.60

Three grades were used on the portion of the State road in Davis County first above named, as follows: 0.61 per cent, 0.20 per cent, 0.30 per cent. On the Secrist Hill there are two grades, as the work has been done up to this time, both of these exceeding the limit of 4.0 per cent fixed by the State Road Commission as the limit not to be exceeded by grades unless so doing could not reasonably be avoided. The grades on this section of road are 4.7 per cent and 5.5 per cent.

Cost of Construction of State Road just described.....	\$ 4,578.60
Additional money spent in construction and repairs on State Road by the county commissioners of Davis County..	1,134.97
Amount of money spent by county commissioners on county roads in Davis County	11,735.02
<hr/>	
Total amount spent on Davis County roads, including State appropriation of \$2,000.00.....	\$17,448.59

IMPROVEMENTS IN MILLARD COUNTY.

Report of Mr. J. R. Bennett, County Road Commissioner and State Agent in Millard County:

Road construction in Millard County began at the railroad station in Oasis and continued in an easterly direction for a distance of ten and one-quarter miles to Mud Spring.

A second piece of road construction on the State road in Millard County was begun at Holden and extended toward Fillmore, covering a distance of five and one-quarter miles.

The minimum cost of constructing a mile of the State road in Millard County is about \$70.00. One mile of road on Mud Lake, just west of Mud Spring, cost about \$400.00 per mile. The average cost of construction from Oasis to Mud Lake is about \$140.00.

The first mile of road south of Holden, made through a formation partly of cement and partly of loose stone, cost about \$600.00, while the average cost per mile of road south of Holden is about \$280.00 per mile.

\$150.00 was expended for culverts on the road leading from Holden toward Fillmore.

No material was used for surfacing the road built in Millard County except the one mile of road south of Holden. On this mile of road gravel was used for a surfacing material.

The following table gives only approximately the cost of road construction in Millard County:

Character of Ground	Surfacing Material	Length of Road in Miles	Width of Road in ft.	Cost per Mile	Total Cost
Alkali Clay Cement and	None	10.25	30	\$140.00	\$1,430.00
Loose Rock Cement and	None	4.25	30	280.00	1,190.00
Loose Rock Culverts	Gravel	1.00	30	600.00	600.00 150.00
Totals		15.50		Approximate cost,	\$3,370.00

IMPROVEMENTS IN SALT LAKE COUNTY.

Report of Willard Snow, County Road Commissioner and State Agent:

The work of construction on the State road in Salt Lake County done during the year 1910 has involved making only a comparatively small amount of cut and a relatively large amount of fill on the short portion of the road which has been improved this year. The cuts were made largely near the top of a steep hill and the fill in the bottom of the large hollow to the south of it.

Were it not for the fact that a large canal crosses the State road near the top of this hill, the cut would have been made deeper, and at much less expense the grade of the road would have been much less than it is at present. As this 3,000 feet of road has been built, there are in this distance some seven different grades. Going south, the grades to which the improved road has been constructed are as follows: 0.6 per cent, 5.8 per cent, 4.4 per cent, 3.5 per cent, and 0.74 per cent. Continuing on southward and going uphill out of the hollow, the two grades used are 0.635 per cent and 2.63 per cent.

The south end of this improvement is at a point about 900 feet north of the southwest corner of Section 7, Township 3 south, Range 1 east, and from this point the im

proved portion of the road reaches northward a distance of 3,000 feet.

The cross section used in constructing this road is that prescribed in the State law for a 7-rod street. The center of the road is built fifteen inches in elevation above the fence line. The slope from the center toward the drain ditch is about three-quarters of an inch to the foot for a distance of twenty-two and one-half feet. From the last named point to the bottom of the gutter there is a fall of twenty-four inches, the slope being made a little more than one-half foot to the inch with a sharp pitch near the gutter. From curb to curb the distance is eighty feet.

This piece of construction has been made unusually expensive because of the fact that an earth fill some 1,000 or 1,200 feet long had to be made with an average depth of about three and one-half feet at the center and one foot at the sides. The earth for making this fill was hauled in wagons for a distance of about one-quarter mile. Since conditions were such that this earth had to be loaded by hand the cost of the earth was comparatively great. Under these conditions 2,200 loads of earth were hauled.

The travelled portion of this road, twenty-four feet wide, was covered to a depth of about eight inches with slag, 1,500 loads of this material being required for the road improved. The cost of this road per mile is about \$5,000.00. Under ordinary conditions, however, the cost should not exceed half of this amount.

The State road from the city limits of Salt Lake City to Sandy has been macadamized with slag and patched with slag from time to time, as necessity demanded. During 1909, in the Crescent district, just south of where the present improvements have been made, the road was graded and covered with slag for a distance of one-half mile. From this point on south to the point of the mountain the road is made of silica rock.

In this county the split-log drag has not been used. Road graders and steel drags seem to answer the purpose better than the split-log drag, since most of the main roads are surfaced with gravel or some other hard material re-

quiring more weight and more power than can generally be had with the split-log drag.

The following table shows briefly the extent, cost, and kind of work done in Salt Lake County:

Character of Ground	Surfacing Material	Length of Road in Miles	Width of Road in ft.	Cost per Mile	Total Cost
Clay	Slag	0.57	80	\$5,000.00	\$3,000.00

IMPROVEMENTS IN SAN PETE COUNTY.

Report of County Commissioners, by O. D. Eliason, Clerk, and Martin Isaacson, State Agent:

While this report deals primarily with the work of constructing roads during the year 1910, the County Commissioners desire to report that during the previous year, 1909, they constructed about six miles of earth road in San Pete County, on what has since been designated by the State Road Commission as the State road in this county. Five miles of this construction was made between Ephraim and Chester, and one mile near Christianburg, in the Gunnison Precinct.

The cross section of this road was made in accordance with the specifications given in the State law for the construction of a road in a street six rods wide.

In April, 1910, between Moroni and Fountain Green, a section of road one mile in length was constructed through a low boggy country. A large portion of the material of which this grade was built was hauled in wagons for an average distance of one mile. The cross section used in this construction is that prescribed in the law for a road in a street four rods wide. This improvement was made through Section 29, Township 14 south, Range 3 east. Three 18-inch concrete culverts and two plank bridges were installed along this road. Cost, \$1,147.25.

Figures 9, 10, and 11 show portions of this highway.

In May and June, 1910, a section of road was constructed 7,200 feet in length through Section 8 and part of Section 17, Township 20 south, Range 1 east. This road is located south of the City of Gunnison. A portion of it

was built through very low boggy country. The conditions were such that wagons had to be used for hauling material here also.

The cross section used in this construction was that prescribed in the law for a road in a street four rods wide. Five 18-inch culverts and one plank bridge were used in this construction. Cost, \$775.75.

During the months of September and October, 1910, 11,700 feet of road construction was made through Sections 13, 14 and 23, Township 18 south, Range 2 east. This road is south of Manti. The cross section used for constructing this road is shown in Figure 1.

The material taken from the cuts and that used for the fills on this portion of the road was largely rock and shale. For a distance of 1,500 feet, the necessary fill to bring the road to the established grade was made by hauling the material in wagons.

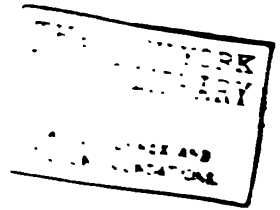
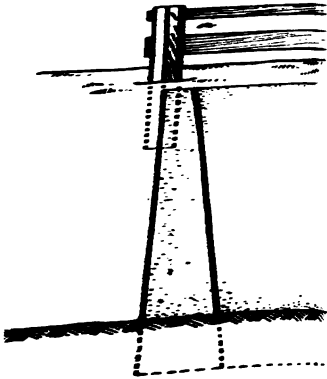
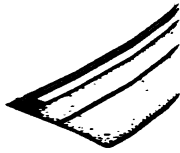
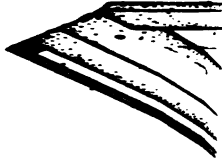
Ten culverts eighteen inches in diameter were used on this road. Cost of construction, \$1,504.55.

South of Sterling a piece of road 2,500 feet in length was constructed in accordance with the cross section shown in Figure 1. Two 12-inch culverts were used to carry water under this road. Cost of construction, \$225.25.

On the road between Ephraim and Chester a piece of road 2,500 feet in length was also constructed. This road was built in conformity with the cross section shown in Figure 1. Two 18-inch concrete culverts and seven 12-inch concrete culverts were used in this construction for carrying water under the road. Cost, \$505.25.

There are two reasons why the cross section shown in Figure 1 is better than those prescribed in the law for the roads in San Pete County. First, a road can be both constructed and maintained cheaper when narrow than wide; second, only ten feet of the road is actually used for traffic after it is built; the remaining portion is but a breeding ground for weeds.

The split log drag has been used in this county over thirty miles of roads since the rains in September, at a



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total cost of \$2.25 per mile, or at a cost of 75c per mile for each dragging. The split log drag gives perfect satisfaction on our roads, which are thirty feet wide, but on roads six rods wide, the operation of dragging becomes slow and expensive.

Character of Ground	Surfacing Material	Length of Road in Miles	Width of Road in ft.	Approximate Cost per Mile	Total Cost
Wet Swamp	Sandy Loam	1.00	48	\$1,147.25	\$1,147.25
Alkali Clay, and Bog	Loam	1.36	48	570.00	775.75
Rock and Shale	None	2.22	30	686.00	1,504.55
Earth	None	0.475	30	474.00	225.25
Earth	None	1.46	30	346.00	505.25
Totals		6.515			\$4,158.05

IMPROVEMENTS IN SEVIER COUNTY.

Report of Hans Tuft, County Road Commissioner and State Agent:

Road construction on the State road in Sevier County in 1910 was begun at a point on the Sevier River on the east line of Section 27, Township 21 south, Range 1 west, Salt Lake Base and Meridian, thence running in a south-westerly direction through Section 33 of the same township, and on through Sections 5, 7, 8 and 18, in Township 22 south, Range 1 west, and to the center of Section 24 in Township 22 south, Range 2 west.

All culverts used in this construction are made of concrete, and are 20 feet in length. Thirteen of these culverts have a cross section of one foot four inches by two feet; one, a cross section of one foot four inches by three feet.

A bridge with concrete abutments sixteen feet high and a span of twenty-two feet, was constructed west of Salina over what is called the Denmark Wash. These concrete abutments are three feet wide at the bottom, one foot wide at the top. The details of this bridge and concrete construction are shown in Figure 15.

The cost of this bridge and its abutments, including the concrete wall one foot thick and three feet deep used to prevent the foundation from washing from under the abutments, cost about \$1,150.00.

About seven and one-half miles of earth road have been constructed in Sevier County in accordance with the cross section shown in Figure 1. No surfacing material has been used on the oad except that found on the ground originally.

The cost of grading this seven and one-half miles of road is approximately \$1,350.00. A portion of this grading has been done at a cost of \$125.00 per mile. However, where cuts and fills have been made necessary to make the surface of the ground conform to the profile prepared before the actual process of grading was begun, the cost has been about \$300.00 per mile.

The culverts named above have cost in the neighborhood of \$27.00 each.

The cost of grading the seven and one-half miles of road, building the culverts, and also the bridges, is approximately \$2,900.00.

Thus far no repairs have been made upon the State road in Sevier County other than dragging the same twice. There has been, during the fall, so little storm that the roads have been most too dry to derive much benefit from dragging.

I recommend that a bill be presented to the Legislature asking that the appropriation for roads be increased from \$1,000.00 per year to \$2,000.00 or \$2,500.00 for each county, the proportion of money to be furnished by the counties to be increased in the same ratio.

Character of Ground	Surfacing Material	Length of Road in Miles	Width of Road in ft.	Approximate Cost per Mile	Total Cost
Sandy Loam and Clay	None	7.5	30	\$ 380.00	\$1,350.00
Bridge with concrete abutments at Denmark	Wash				1,150.00
					<u>\$2,500.00</u>

IMPROVEMENTS IN UTAH COUNTY.

Report of Frank Wentz, Surveyor of Utah County:

The work of constructing the State road in Utah County began at the county line on the north at Station 1182 and continued to Station 1090, a distance of 9,200

feet, or approximately 1.9 miles. From Station 1167 to Station 1182 the road is constructed with the cross section shown in Figure 1, while from Station 1167 to 1090, where the road is located almost entirely on ground with a comparatively steep slope at right angles to the road, the cross section twenty feet wide shown in Figure 16 was used.

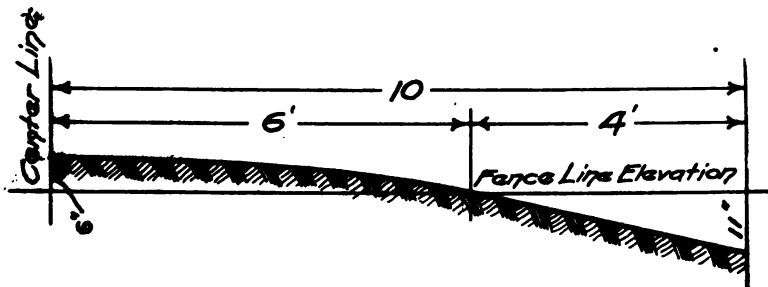


FIG. 16

The soil along this 9,200 feet of road is mostly gravel with sufficient clay and earthy material combined with it to make a good road. In a few places where loose sand and gravel were encountered the road was surfaced with the best material at hand. Thus is insured a road with a good, hard and satisfactory surface.

The maximum grade on this portion of the road is four per cent. The road in the northern part of the county was so located as to secure this maximum grade and at the same time reduce the length of the road 700 feet.

The cost of building this road, including culverts and cross drains, and not including the cost of engineering or the services of the foreman, is \$1,050.00, or approximately \$550.00 per mile.

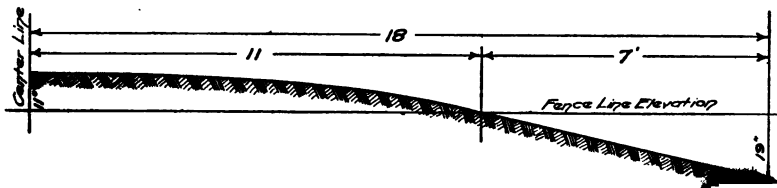


FIG. 17. CROSS SECTION USED ON PORTION OF STATE ROAD IN UTAH COUNTY.

An earth road thirty-six feet wide, made in accordance with the cross section in Figure 17, was built from Station 121 to Station 381, and also from Station 431 to Station 442. This construction covers the greater portion of the distance across Provo Bench, and practically completes the road grading from Payson City north to the north boundary line of Utah County.

The station numbers on the road run from the south toward the north, and from Station 120 plus 92.52 the section corner common to Sections 25, 26, 35 and 36, Township 6 south, Range 2 east bears north $0^{\circ} 49'$ west, a distance of 1,251.36 feet.

The points at which the center line of this road intersects the lines of the public survey are all indicated on the profile of the road.

The soil along the line of this construction is largely sandy loam with some gravel. Wherever the sand was found in quantities too great to pack and form good road surface, clay to a depth of four inches was hauled upon the road for a surfacing material. All loose stones were moved from the surface of the road.

Since the rains this fall a road grader has been used for the purpose of cutting off the high points and filling the small depressions. This has left the road in good condition for winter. It is expected that in the future the surface of this road will be smoothed with the road drag. The total length of this section of improvement is 27,100 feet, or approximately 5.13 miles. The total cost of the same is \$3,276.40, or approximately \$640.00 per mile.

From Station 796 to Station 822, between the cities of Lehi and American Fork, a road has been constructed with a width of thirty-six feet. The cross section of this road is also shown in Figure 17. This road has been surfaced with a gravelly clay mixture, which was hauled in wagons for a distance of one-half mile.

After each of the recent storms this road has been thoroughly dragged. The surface at present is firmly packed. This construction is such as to insure a firm and lasting road surface. The length of this improvement is 2,600 feet, or approximately one-half mile. Total cost, \$798.50. Approximate cost per mile, \$1,600.00.

Immediately north of Provo City, near the river bridge between Stations 76 and 98, a shale road has been constructed. The soil in this section is a black sedimentary clay, very sticky, and such that during the wet seasons of the year the material seems to be bottomless. This portion of the road was graded to a standard cross section with shoulders. On this was placed a layer of gravel, which was rolled with a 14-ton road roller. The limestone shale placed upon the top of this gravel was sprinkled and thoroughly rolled before it received the finishing coat one inch thick of shale dust. This construction has made a first class hard and durable road, almost equal to macadam.

The grading of this section of road cost \$375.00, the gravel 30 cents per yard in place, and the shale and shale dust \$1.00 per yard in place. The total cost of gravel, shale and shale dust, including rolling and sprinkling, is \$477.00, making the total cost \$852.00, or approximately \$2,052.00 per mile.

While the main county road south from Provo to Payson has not as yet been designated as a portion of the State road through Utah County, this designation no doubt will be made at the proper time, and therefore it will perhaps be proper to give this report the following information concerning the improvement which has been made on this portion of the county road, although the work was not done under the supervision of the State Road Commission.

From Station 390 to Station 523, a distance of 13,300 feet, or approximately 2.5 miles of road, a portion of which was constructed under very bad conditions, the ground in parts was wet and boggy, making large side drains necessary. The above conditions, in addition to the long haul made necessary in order to make the large fills and to secure the proper surfacing material, account for the comparatively large cost of this road. Including culverts and cross drains, the cost is \$4,936.00, or \$1,960.00 per mile.

Character of Ground	Surfacing Material	Length of Road in Miles	Width of Road in ft.	Approximate Cost per Mile	Total Cost
Earth	None	1.9	30 20	\$ 550.00	\$1,050.00
Gravelly	Clay, 4"	5.13	36	640.00	3,276.40
Clay	Gravel	0.5	36	1,600.00	798.50
Clay	Shale	0.42		2,050.00	852.00
Clay	Gravel	2.5		1,960.00	4,936.00
Totals		10.45			\$10,912.90

Mr. Charles H. Ward, Chairman, Board of County Commissioners of Utah County, reports as follows:

The total expenditures on highways in Utah County during the year 1910 is as follows:

1. For building 150 cement concrete culverts	\$ 5,200.00
2. For State road work as per report, with addition since that date	11,000.00
3. Eighteen miles of new construction	9,000.00
4. Provo-Olmstead Boulevard.....	4,000.00
5. Road machinery	5,000.00
6. General repair and maintenance of county roads	7,800.00
Total	<u>\$42,000.00</u>

Suggestions concerning the changes in the law have already been sent to you.

Very respectfully submitted,

(Signed)

RICHARD R. LYMAN.

DAVID MATTSON.

Member State Road Commission.

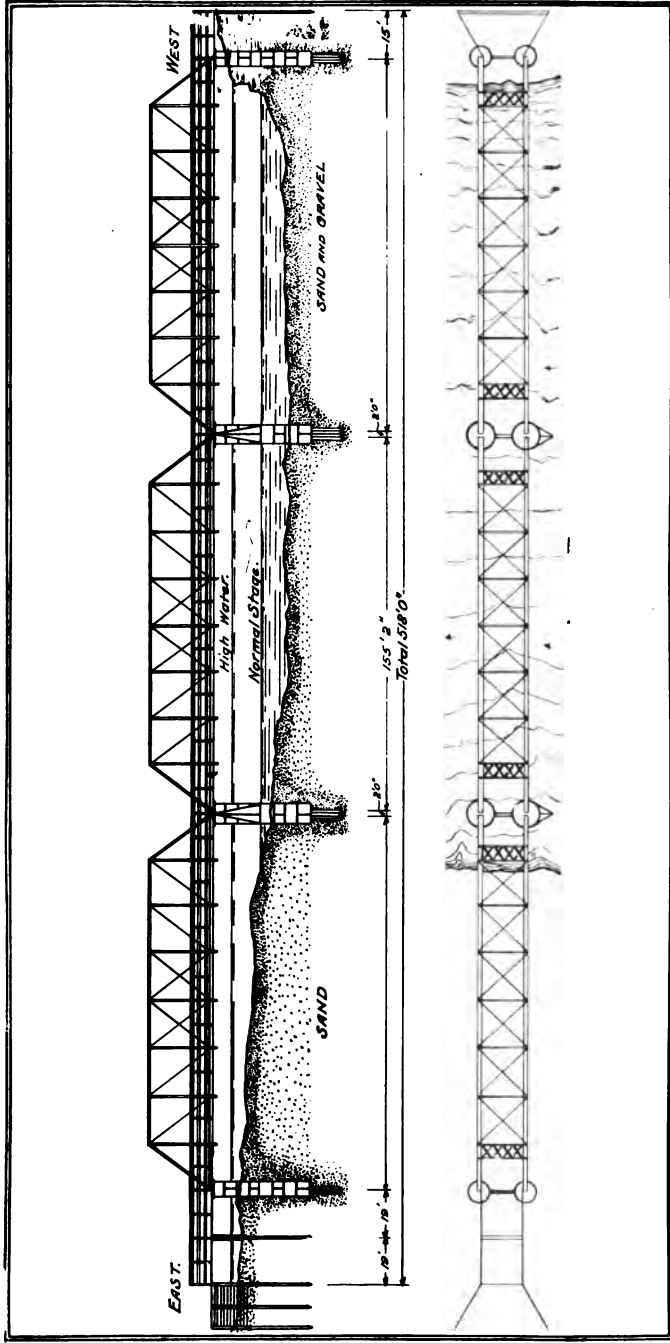
Dear Sir:

Please find herewith road reports of Wasatch County (the photograph of Theodore bridge is missing), Uintah County, Grand County, Emery County, San Juan County, and Weber County. I have no report from Carbon County and, inasmuch as there is a dispute about the work in said county, I do not expect a report.

IMPROVEMENTS IN UINTAH COUNTY.

Report of Mr. Sylvanus Collet, Agent in charge of construction:

The work started at the center of the north line between Sections 23 and 26 in Township 4 South, Range 21 East, Salt Lake Meridian, thence south one mile to north line of Section 35, thence east one and one-half miles



STATE HIGHWAY BRIDGE OVER GREEN RIVER AT JENSEN, UTAH COUNTY, IN COURSE OF CONSTRUCTION.
MIDLAND BRIDGE COMPANY, CONTRACTOR.

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TILDEN FOUNDATION

to the northeast corner of Section 36, thence south three and one-half miles to center of Section 13, Township 4 South, Range 22 East, Salt Lake Meridian, to point where State Road turns east to Jensen. I have taken two township plats and drawn a line with ink, outlining the road and culverts with cross lines. I will number them and give a description of each.

No. 1. Plank culvert 30 ft. long, 2 ft. wide, 8 in. deep.

No. 2. Rock culvert 30 ft. long, 4 ft. walls, 7 ft. wide, with plank covering. At this point a drain was cut on west side of road to gulch 200 ft. long, 7 ft. at deepest point.

No. 3. Plank culvert 25 ft. long, 1½ ft. wide, 8 in. deep.

No. 4. Stone culvert 25 ft. long, 2 ft. wide, 2 ft. deep.

No. 5. Plank culvert 25 ft. long, 1½ ft. wide, 14 in. deep.

No. 6. Plank culvert 25 ft. long, 2 ft. wide, 14 in. deep.

No. 7. Plank culvert 30 ft. long, 2 ft. wide, 14 in. deep.

No. 8. Plank culvert 25 ft. long, 1½ ft. wide, 8 in. deep.

No. 9. Stone and cement culvert 25 ft. long, 2 ft. wide, 2 ft. deep, with standstone slabs 8 in. thick for covering with 1 ft. of earth on top.

No. 10. Plank culvert 25 ft. long, 1½ ft. wide, 8 in. deep.

No. 11. Plank culvert 18 ft. long, 2½ ft. wide, 2 ft. deep.

No. 12. Plank culvert 30 ft. long, 2½ ft. wide, 14 in. deep.

No. 13. Stone culvert 27 ft. long, 2 ft. wide, 2 ft. deep, covered with standstone slabs 8 in. thick and earth on top.

No. 14. At section line between Sections 36 and 1, Township 4 South, Range 22 East, plank culvert 4 ft. wide, 16 in. deep, 30 ft. long.

No. 15. Plank culvert 30 ft. long, 1½ ft. wide, 8 in. deep.

No. 16. Plank culvert 30 ft. long, 1½ ft. wide, 8 in. deep.

No. 17. Plank culvert 30 ft. long, 1½ ft. wide, 8 in. deep.

No. 18. Plank culvert 30 ft. long, 2 ft. wide, 14 in. deep.

No. 19. Stone culvert 30 ft. long, 3 ft. wide, 4 ft. deep, with standstone cover 10 in. thick and 2 ft. of earth on top.

No. 20. Plank culvert repaired, 16 ft. long, 14 in. deep.

No. 21. Plank culvert 16 ft. wide, 14 in. deep.

No. 22. Logs for sides, plank covering, 20 ft. long, 2 ft. wide, 2 ft. deep.

No. 23. Plank culvert 30 ft. long, 1½ ft. wide, 14 in. deep.

No. 24. Plank culvert 25 ft. long, 2½ ft. wide, 2 ft. deep.

No. 25. Plank culvert 25 ft. long, 2 ft. wide, 16 in. deep.

No. 26. Plank culvert 25 ft. long, 1½ ft. wide, 8 in. deep.

No. 27. Plank culvert 25 ft. long, 1½ ft. wide. 10 in. deep.

No. 28. Repaired culvert 16 ft. long, 1½ ft. wide.

No. 29. Repaired culvert 16 ft. long, 1½ ft. wide.

No. 30. Repaired culvert 16 ft. long, 1½ ft. wide.

No. 31. Repaired culvert 16 ft. long, 1½ ft. wide.



UNITED STATES GOVERNMENT HIGHWAY BRIDGE OVER DUCHESNE RIVER NEAR MYTON, WASATCH COUNTY

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Did not do any work on last one-half mile, except the repair of culverts, on account of funds.

In answer to your eight questions I will reply as nearly as I can:

Nos. 1 and 2: I have taken two township plats and drawn a line with ink to outline the road and give a description of culverts.

No. 3: I have graded in the road, making the road head 33 ft. wide where I could get earth to do so; the grade is from 25 to 33 ft. in width, grading it up to a full center. Using no other material only what was along the roads, as it is a rolling road, there was cuts and fills along the entire length of road, with the exception of 1½ miles running east, which was worked with road grader and plow. Where it can be worked in this way the cost is \$200 per mile. Owing to the cuts and fills that were made necessary to give to the road the proper grade in the six miles of work which has been done, the cost has averaged \$532.55 per mile.

No. 4: I have constructed six miles of road at a cost of \$3,195.25; an average cost of \$532.55 per mile.

As we have a hardpan of cement gravel in this valley, it is hard to work; especially where there are cuts and fills.

No. 5: I will try and get you some photographs showing the conditions of the roads.

No. 6: For 1910 the county has expended in repairs on the State Road about \$50.00, as near as I can learn.

As for drags on the earth road, we have done but little. What we find good for our roads after storms and in the spring is to go over them with a disc harrow then with a leveler made out of plank 16 feet long and 7 feet wide, with three cross pieces in it, and then weight it. It smooths our roads the best of anything we have tried; however, we do not follow it up close enough after each storm to have the best results. The disc harrow will do a good work on roads.

If the County would go to the expense of making several of these drags or levelers, taking strap iron and fastening up these cross pieces, and put them at different places along the roads and let the public know they were placed there to be used by them for the benefit of the roads, then encourage the people in leveling the roads along by their own premises, it would assist in keeping the roads in better condition. Then, too, if the public knew where they could find the drags they would use them more.

I will finish my work this week, as I have the earth work done. Will put the balance on culvert on the last half mile which I have reported to you.

The public has donated in cash and labor to the amount of \$445.25, which is shown in my report of the amount expended.

(Dated Dec. 12, 1910.)

IMPROVEMENTS IN WASATCH COUNTY.

Report of John W. Moffitt, Agent in charge of construction:

I commenced work at Myton thence running west to Theodore, a distance of twenty-two miles; built all dug roads 12 feet wide, and two bridges at a cost of \$25.00 each. Although this road is not complete two or three miles below Theodore, with a small amount of work it will make an exceedingly good road. I used no material except that found in making the road.

From Theodore to Willow Creek Canyon on the Theodore and Colton road, a distance of thirty-five miles, made all dug roads in a fairly good condition; one small bridge, at a cost of \$10.00, at head of Indian Canyon and Willow Creek; built a dug road on south side of mountain a distance of five miles, 12 ft. width; built two bridges at a cost of \$1,000.00. The road from this point to Colton is incomplete for this year; hope we will be able to complete it next year.



COUNTY HIGHWAY BRIDGE OVER STRAWBERRY RIVER NEAR
THEODORE, WASATCH COUNTY.

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From Theodore to Heber City repairs were made on all dug roads and dangerous places, and seven bridges were built at a cost of \$25.00 each. This road, like all others in this county, has its own covering sufficient to make a good road bed.

The Theodore bridge was built of the very best native timber obtainable, 95 ft. long and 16 ft. in width, under the direction of the best mechanical skill at hand, at an expense of \$1,000.00.

I am unable at this time to give you a profile of the road, as the engineer has just sent his map to the County Clerk to be approved and sent to the Secretary of the Road Commission; however, I will do this work later when I can get to the county office and see the maps.

The point where construction was begun and where finished is given in the first part of my report. I have covered a distance of 155 miles and repaired the road the entire distance; also, ten miles of new road was constructed and five and one-half miles of heavy dug roads.

Am sending photographs of the Myton and Theodore bridges. I have no photographs of roads.

Will say, the county has spent about \$5000 on these roads in the last two years.

Split-log drags are a great success. Any ordinary road can be smoothed with a split log drag after a rain storm at an expense of \$4 per mile. I know of no better method of smoothing as cheap as the drag.

(Dated Dec. 15th, 1910.)

IMPROVEMENTS IN GRAND COUNTY.

Report of J. P. Miller, agent in charge of construction:

There is a new survey now being made of the State highway from Thompson to Moab, and when completed a map or tracing will be filed with the Road Commission.

Answers are according to new survey:

1st. I began road construction at a point 1612 feet southwest of milestone 8 and ended at milestone 13, south of Thompson, Utah, then moved to Courthouse Station and began work 1250 feet north of Milestone 19, and I am now working toward milestone 20. When work is completed I will make a full report.

2nd. Will send a tracing of State highway as soon as engineer has it completed. Built fourteen stone culverts up to milestone 13, the size of each averaging 14 feet long with about a 1x2 opening, with stone floor and stone sides and tops. Built a bridge with stone abutments, laid in cement, at 11 miles and 1680 feet from Thompson. This bridge is 16 feet long, 14 feet wide, with plank top.

3rd. Made dugway nearly all the way from place of beginning to about one-fourth mile past milestone 9, then made a fill over a low piece of ground for about one-fourth mile, which was covered with a lime shale; then graded one-half mile with a Road King grader to Ten-Mile Wash, then a dugway for about one-fourth mile, to milestone 10; then not much work for about one-fourth mile; then a dugway for one-half mile; then on last quarter was a heavy dugway to milestone 11, then road was graded to milestone 12; then built a ditch along upper side of road to milestone 13, and filled all small washes; crossing road to near milestone 13 another stone culvert was built.

4th. Have not segregated the work enough yet to answer definitely.

5th. Have no pictures; may get some later.

6th. No dragging has been done except where I graded a piece of road, which was well dragged.

7th. No dragging has been done, except as stated in No. 6.

I will send you under separate cover a photo of the State bridge at Green River, also a view of the Grand River at Moab, where we expect to build the next State bridge.

(Dated Dec. 10, 1910.)



STATE HIGHWAY BRIDGE OVER SAN JUAN RIVER AT NARROWS,
SAN JUAN COUNTY.

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ROAD OVER NAVAJO HILL, SAN JUAN COUNTY.

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IMPROVEMENTS IN SAN JUAN COUNTY.

Report made by Mr. M. A. Barton, agent in charge of construction:

Complying with your request, I herewith submit a statement of what has been done in road construction. I fear it will be rather irregular on account of inconvenience.

In the first place, when we started work on the county was using all its tools, and, as I could not buy any steel nor hammers, caps, fuse, etc., I borrowed some from individuals, and we made best use of what we could get in the worst places before we confined ourselves to any particular stretch of road. However, what we have done, we have tried to make permanent. Therefore, to question No. 1, it would be hard to answer only in an informal way, as I have done.

I haven't a plat with me so I can designate the sections in which we have worked. So far we have used but one culvert, and that is at the spring in Cow Canyon, about one mile from here. We have not used any surface material so far, only that upon the immediate grounds. It is hard to give a specific width of the road. Some places it is built in solid rock 8 feet wide, and others it does not exceed 12 feet.

Comb Wash, Butler Wash, Cow Canyon, and Devil Canyon were the places designated for the expenditure of the present appropriation, and repairing and reconstruction has taken place between Cow Canyon and Comb Wash, a distance of about 12 miles, at a cost of \$265.20, including 5 pounds of powder, for which I have not received a bill, up until December 1, 1910.

I enclose pictures of bridge across San Juan River and Navajo Hill, also one of Mexican Hat, showing the kind of country we are building roads in. These are the only photographs obtainable at present.

I understand that the county has had the County Road Commissioner on the road nearly all the time since this became a state road. I do not know of the split-log

drag being used in this county. The heavy rains come in the spring, middle summer and fall, and almost unavoidably do a great deal of damage. And it is because of recent rains that we have not been able to confine ourselves to any particular place, but expect to from now on as we have nearly all the worst repairing done.

In order that we could have a better road west of the Navajo Hill into the oil-field proper, instead of going up Comb Wash and over Lime Ridge, several oil men came to me and said if I could have a route marked out they would spend a few thousand dollars on the road and then after it was finished the County Commissioners might accept it as a county road or state road. In order to get the public sentiment, I called a meeting on December 9, by order of the County Commissioner, and the result was very favorable. Three men were appointed by the meeting to designate a better route than the old one and a much more direct one, and I was informed within a week that at least \$5000.00 had been raised to improve the way to the oil field, and it is expected to be finished by January 1, 1912.

Further over towards the bridge a great deal of the finest road building has been going on for the last three weeks. This, of course, is a great benefit to the State and county. There is a great deal going on in the oil field, sufficient to justify good roads. Several wells have been struck within the past two weeks. Some days the road is just lined with teams and horsemen.

I trust this informal statement will help you in your report, and hope by the next time I can give more detail on every particular piece of construction.

(Dated Dec. 12, 1910.)

IMPROVEMENTS IN EMERY COUNTY.

Report by Mr. David H. Wood, agent in charge of construction:

1st. Grading was begun at the northeast corner of Castle Dale, at a point about 1000 feet west of the



STATE HIGHWAY BRIDGE OVER GREEN RIVER AT GREENRIVER, BETWEEN EMERY AND GRAND COUNTIES, MIDLAND
BRIDGE COMPANY, CONTRACTOR.

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one-fourth corner between Sections 34 and 35, Township 18 South, Range 8 East, Salt Lake Meridian, and continues north along the county road to the south side of Huntington, beginning again on the north side of Huntington at a point about 800 feet south of the crossing of Huntington Creek and continuing to a point about a mile and a half north of the crossing of Cedar Creek (wash marked on map.)

2nd. We have no profile of the roads as yet, and, if it is necessary, notify the commissioners and one will be made; i. e., the survey will be made. The culverts are made from plank mostly 14 feet long.

3rd. The improvements consist of grading the road or making a turnpike 42 feet wide and straightening it whenever the opportunity afforded, also cutting the hills and making the grade lighter and filling the swales wherever it was possible to do so to an advantage, and bridging Cedar Creek Wash. Cross section of road bed on separate sheet.

4th. Sixteen miles; total cost \$2,633.00 per mile, except at the Cedar Creek Wash, \$143.13, owing to the bridge at Cedar Creek that mile cost about \$486. The cuts were about equal per mile. No surface material was used.

5th. We have no photos of the bridges. Mr. J. J. Burk, the contractor, has some of the bridges he built. We have none of any part of our roads.

6th. No split-log drags in use in the county this year. After the heavy storms the grader was run over the road twice, which gave good results. The total cost for about thirty miles was \$80.

7th. This is answered above as near as I can from the information I have.

8th. I will suggest that it would be a very good thing in counties like this to have it a duty of the County Surveyor to measure the drainage area of all washes and gullies that cross the county roads so as to calculate the size culverts that will be needed in each crossing so that after each storm the road will not be left impassable for a day or so, and that it also

be his duty to lay out all new roads under the direction of the Commissioners, for most cases if he is a man who is following engineering he will know more about the building of roads than the inexperienced man.

Since these questions were answered I have found a small photo of the Orangeville bridge that was taken while under construction, also a photo of the Green River bridge that was published in the paper at Green River.

(Dated December 14, 1910.)

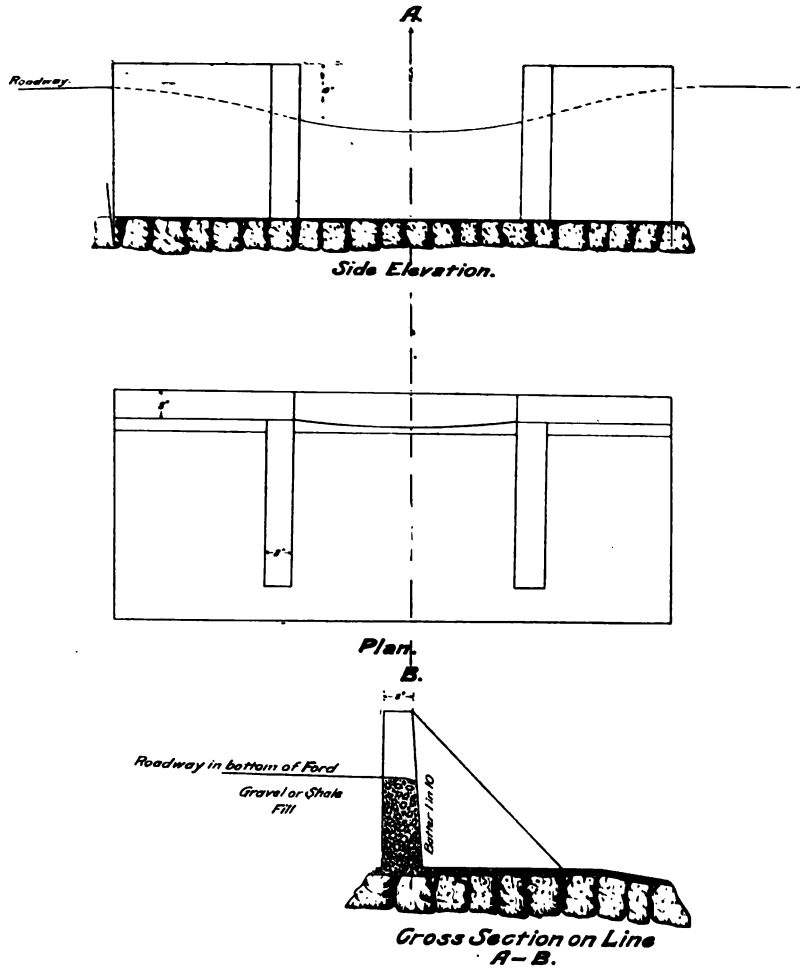
IMPROVEMENTS IN WEBER COUNTY.

Report by Mr. John C. Child, Agent in charge of construction:

"During the years 1909-1910, Weber County has constructed 5.53 miles of State road at a total cost of \$17,672.76; of this, 3.88 miles were constructed from the south city limits of Ogden to the Davis County line, through the Burch Creek, Riverdale and Roy districts; .65 of a mile was constructed, beginning at the Box Elder County line on the north and running south in the Pleasant View district.

The road to the south of the city limits through Burch Creek and Riverdale districts consisted of grading and rolling, necessitating several large cuts and fills, as shown on the profile, the heaviest cuts and fills being encountered in the Burch Creek district. Of this work, 1.14 miles was in Burch Creek and the cost per mile was \$4,128.00; 2.62 miles in the Riverdale district at a cost of \$1,850.00 per mile; 1.12 miles in the Roy district at a cost of \$2,674.00 per mile. The road through Burch Creek and Riverdale is a six-rod road, while that in Roy is a four-rod road.

In addition to grading and rolling the road through Burch Creek and Riverdale, the road through Burch Creek, 1.14 miles, was macadamized at a cost of \$4,328.00, the shale used in covering this road being hauled from Ogden Canyon.



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The most favorable conditions encountered were in the Riverdale district where but very few cuts or fills had to be made, and you will notice that the cost of construction per mile in this district was only \$1,850.00.

The difference in the cost per mile between Riverdale and Burch Creek was caused through several large cuts and fills which were necessary in the Burch Creek district. The difference in the cost per mile between the Riverdale and Roy districts was caused through surfacing the Roy road with sixteen inches of black soil which had to be transported a considerable distance.

The road in Pleasant View was macadamized, the shale being taken from the hills about a mile distant. This road was well graded and the only cost was for macadamizing, \$692.55, or \$1,065.00 per mile.

In regard to the repairs made upon the State road, will state, that we have had, so far, no occasion to make any repairs, and also had no use for the split-log drag.

The rain storms here have been very light. While the split-log drag may be very useful where the rain storms are heavy, I do not consider it very effective on roads where the rainfall is light as in Weber County.

In addition to the improvements made on the roads, Weber County has installed a sprinkling system to sprinkle the entire state road from the south city limits to the Davis County line, at a cost of \$6,983.91, and during the summer months will keep this road well sprinkled.

I am mailing, under separate cover, a profile of the State road south of the city, and also one for the Pleasant View road, and will endeavor to forward within the next few days several photos of Weber County roads, as requested.

(Dated December 15, 1910.)

Very respectfully submitted,

DAVID MATTSON.

CALEB TANNER.**Member State Road Commission.**

The work in the several counties assigned to the Secretary of the Commission for supervision was, except in the cases of Piute and Garfield Counties, placed entirely in the care of local men.

In Piute County the State Land Board had in the construction of a reservoir, between Marysvale and Junction, destroyed the old county road, and were therefore under obligation to provide a way around the reservoir above the high water mark. Instead of providing such a road, the Land Board consented to expend the money such a road would cost in assisting to build the State road, which was located something like one mile west of the reservoir. On account of this relation of the State Land Board and the State Road Commission business in Piute County, the engineer in charge of the work for the Land Board had the direction of the expenditure of money for State road purposes in Piute County.

I submit herewith reports of the several agents of the State in counties over which my jurisdiction extended:

IMPROVEMENTS IN PIUTE COUNTY.

Reported by Mr. Joseph Jenson, engineer in charge:

In Piute County a stretch of road was selected extending southward from the upper road crossing on Cottonwood (locally known as Ten-Mile) Creek and toward Junction. The country over which the road extends consists of a series of ridges and hollows running approximately at right angles to the direction of the road, and form the talus slope of the high mountain on the west, locally known as Gold Mountain.

The formation, except four or five inches of weathered material on top, is for the most part a clayey gravel, with a large quantity of boulders and rocks in-

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REINFORCED CONCRETE BRIDGE OVER BULLION CREEK AT
MARYSVALE, PIUTE COUNTY.



STATE HIGHWAY BRIDGE OVER SEVIER RIVER AT MARYSVALE.



CONCRETE CULVERT, STATE ROAD, PIUTE COUNTY.



OLD TIMBER CULVERT, STATE ROAD NEAR MARYSVALE, PIUTE COUNTY.

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corporated. About sixty-five per cent of the distance this material is cemented and very hard, making it extremely difficult to plow with a good four-horse team. The hollows between the ridges are from 100 to 200 feet deep, but slope quite abruptly toward the east. This necessitated a number of curves and consequent dugways in order to maintain a moderate grade.

Fills and cuts might have been used to obviate these curves, but the extent of the fills and the difficulty in loosening material for cuts made the expense for a straight road so high as to be practically prohibitive. During spring thaws and summer rains these hollows or canyons, some of which drain considerable areas, are subject to heavy floods.

Two forms of crossing structures were used in such places, namely, concrete culverts (see cut) where the washes have considerable depth; where the washes are comparatively shallow with hard bottoms, ford structures, consisting of a retaining wall and apron on the downhill side of the road, were used. (See cut). The slope of the country is such that the road grade requires protection from surface water on the upper side only, and all the grading material was taken from this side in order to make the borrow trench on the upper side as strong as possible.

The road was designed to have a wearing surface sixteen feet wide with about an eight-inch crowning. The survey contemplated a maximum grade of five per cent. This involved some cuts on the sharper ridges. On account of the extreme difficulty in excavating this material, some of the cuts were not made as deep as contemplated; so, some short stretches, not exceeding twenty-five feet in any one place and aggregating less than two per cent of the total distance, the grade exceeds the contemplated five per cent, but in no instance does the grade exceed seven per cent.

Besides the stretch of road above described, a reinforced concrete arch bridge was built over Bullion Creek at Marysvale, and \$100.00 was expended by the Wayne County officials on that part of the road between Richfield, Sevier County, and Loa, Wayne County, which lies in Piute County.

METHOD OF CONSTRUCTION.

The method of construction adopted was to first plow thoroughly the strip to be occupied by the road grade, and also the borrow trench. All brush and loose stones were removed. The entire plowed area was then thoroughly harrowed and further cleared of stones. The grade was then started by turning over onto the lower side of the roadway, by the use of common tongue scrapers, the upper layer over the borrow trench. As the grading proceeded, the harrowing and removing of stone was carried on continuously, and in addition thereto a leveler or drag was started. This drag was in the form of a long frame with two intermediate cross beams faced with one-half-inch by four-inch steel strips on the go-ahead edge.

As the entire stretch of road is on sloping ground, the grade was first built up to horizontal planes by filling on the lower side and compacting by the method just described. The crowning was then started and gradually increased until the desired form and elevation was reached.

For the most part the material in the borrow trench immediately under the brush roots was found to be excellent road material, except for the large quantity of rocks and boulders incorporated. A considerable force of laborers was kept constantly employed in removing these as the grading progressed. When the grade was completed the entire road surface was hand-raked. The process employed, although the ground was very dry, resulted in a comparatively hard road bed, and a considerable portion of the travel between Junction and Marysville was automatically diverted over the new road, so that even before the first rain the road became very hard and compact.

Notwithstanding the precautions taken to remove rocks from the grading material as it was put in place, it was surprising to note the number of rocks which came to the surface through use. After the road had been used for several weeks a sharp-tooth harrow was put



NEW STATE ROAD, PIUTE COUNTY.



COUNTY ROAD BETWEEN MARYSVALE AND JUNCTION,
COUNTY.

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on and weighted, also the leveler or drag above mentioned was weighted, and, with four good horses hitched, put to work on the road surface. The combined action of the harrow and drag was to bring to the surface an almost complete layer of rocks, varying in size from the size of a cocoanut to a hazlenut. The entire surface was then again hand raked. The result was to leave a smooth, finely pebbled road surface, with enough cementing material to form a very compact and resistant wearing surface of excellent quality.

Much credit is due Mr. D. H. Norton, of Junction, who had the responsibility of foreman on this work, for his conscientious adherence to instructions (a rather rare quality), his efficient handling of the labor force, and his judgment in all matters pertaining to the details of construction which it was impossible for the Engineer in Charge, on account of other duties, to always look after in person.

COST DATA.

26,000-ft. graded road between Ten-Mile Crossing and Junction.....	\$2,080.89
Grading approaches to bridge at Marysvale.....	130.00
Expended on Richfield to Loa Road.....	100.00

Bridge at Marysvale.

Excavation and backfill	\$ 47.61	
Building and taking down forms.....	13.45	
Hauling cement	4.50	
Gravel	33.75	
Labor on concrete, including rip-rap.....	129.25	
One-hundred and fourteen sacks cement at 70c....	79.80	
Reinforcing iron, 306 lbs. at 4c.....	12.24	\$320.60

Waste Ditch ulvert at Marysvale.

Gravel	\$ 9.00	
Excavation and backfill.....	6.75	
Forms	4.00	
Labor on concrete.....	22.75	
Cement, ten sacks at 70c.....	7.00	\$ 49.40

Between Ten-Mile and Junction.

Culvert 3x4x25:

Hauling water and gravel.....	\$ 36.00	
Eighty-five sacks cement at 85c.....	72.25	
Labor, forms, and concrete.....	88.06	\$196.31
		<hr/>

Culvert 3x4x18:

Hauling water and gravel.....	22.00	
Fifty-five sacks cement at 85c.....	46.75	
Labor, forms, and concrete.....	53.75	\$122.50
		<hr/>

Ford No. 1:

Hauling water and gravel.....	14.00	
Eighteen sacks cement at 85c.....	15.30	
Labor, forms, and concrete.....	25.50	54.80
		<hr/>

Ford No. 2:

Hauling water and gravel.....	11.50	
Fifteen sacks cement at 85c.....	12.75	
Labor	21.25	45.50
		<hr/>

Average distance of hauling water and gravel, $1\frac{1}{4}$ miles.

SUMMARY OF EXPENSES

26,000-ft. or 4.905 miles road grade at \$403.85 per mile.....	\$2,080.89
Grading approaches to bridge at Marysvale.....	130.00
On Richfield to Loa Road.....	100.00
Bridge at Marysvale.....	320.60
Waste ditch culvert at Marysvale.....	49.40
Flood structures between Ten-Mile and Junction—two culverts and two fords.....	419.11
Lumber for forms still on hand.....	29.80
	<hr/>
Total.....	\$3,129.80

Of this amount \$2,500.00 was drawn from the State Road Commission fund; balance, \$629.80, was drawn from the Piute Reservoir Fund.

Note: The storage reservoir being built by the State Board of Land Commissioners immediately east of the State road submerges approximately one and one-half miles of the original county road. With the consent of the Piute Board of County Commissioners, the State Board of Land Commissioners authorized the State Engineer to apply on the State road the amount necessary to build a road above the high water line of their reservoir to take the place of that part of the county road submerged.

(Dated Dec. 26, 1910.)



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IMPROVEMENTS IN WAYNE COUNTY.

An inspection of roads in Wayne County was made in July, 1910. Very severe floods occurred during the spring and winter of 1910 along the Fremont River below Teasdale, so that in many places the wagon road was entirely washed away.

It was agreed with the County officials that the road fund available for Wayne County should be spent for constructing a destroyed section of the road just above Caineville; build a bridge across the Fremont River just above where Sand Wash enters; repair and protect some badly washed sections of road between Sand Wash and Pleasant Creek; build a bridge across Pleasant Creek; to clear Capital Wash from boulders so that it could be travelled; construct a culvert and a ford crossing between the head of Capital Wash and Junction; build a bridge across the wash about three miles below Teasdale.

No report has been received from the agents in charge of this work—Andrew Saunders, of Loa, and George A. Chappell, of Lyman. Pay-rolls and vouchers received in the office of the Secretary of the Road Commission indicate, however, that the work is in progress.

IMPROVEMENTS IN GARFIELD COUNTY.

Joseph Jensen, Engineer in Charge; Ralph DeLong, State Agent:

Dear Sir: In accordance with your letter of instructions, the stretch of heavy sand immediately south of Veater's ranch was carefully gone over. It was decided that the most practical plan to overcome this piece of bad road was to lay out a new road on top of the bench immediately west of the road in question. This involved a rather heavy dugway just back of Veater's barn, by which to gain the top of the bench, and the crossing of five washes, some of which were at the bottom of hollows or canyons about 90 to 100 feet lower than the general level of the hill. Aside from these irregularities, the route selected contained two stretches of sand; one

1,000 feet across, the other 300 feet. Splendid road material was found immediately adjacent to these sand stretches, and there was discovered after excavation was begun, about midway of the longer stretch and immediately under the brush roots, a fine clayey gravel, which made the construction over these stretches of sand a comparatively simple matter. The rest of this stretch of road was a natural and easy grade, joining the old road again on top of the hill just north of Orton post-office.

The old road immediately north of Veater's ranch is located between the field fence and an irrigation ditch which crosses and recrosses the road several times. With the wear of travel and the seepages of overflow of water from the canal, the road has been worn away until it is practically the canal itself. To make a permanent road bed along this stretch would necessitate the hauling in of material for a high grade, the construction of several canal crossings, and frequent cross trenches, to take care of the seepage from the canal.

The road and canal skirts the toe of a gently sloping hill, with usual hills and hollows, but of only moderate differences in elevation. The material along this side-hill is similar in nature to that described in my report of this date on the State road in Piute County, except that it was somewhat coarser. Our experience on the Piute County road had shown that by thorough elimination of rocks from this class of material and a proper handling of the finer stuff an excellent road bed could be had. The State road was consequently located above the canal instead of between the canal and the fences, as an extension to the road already laid out over the bench as above described.

The total distance of road selected to be worked was approximately three miles, and it was my judgment that with the means available, the entire stretch could be finished and probably have some money to expend at some other points.

Mr. Ralph DeLong, of Panguitch, had been selected by the County Commissioners and approved, I believe, by the State Commission as agent to have immediate

charge of this work, and I was to furnish plans and specifications and act in an advisory capacity only.

Accordingly, I went over, with Mr. DeLong, all the details and methods of construction, had him accompany me over the Piute County road to observe methods and results which had been found satisfactory there, and later furnished him with plans and specifications for road culverts, these being duplicate copies of drawings made for the Piute County road.

The methods of construction advised and carefully explained to Mr. DeLong were the same as those I have already described in my report on the Piute County road, except the sand stretches. These were first graded with the material along the route in the usual way, then dragged down to nearly flat top, and crowning of about 8 inches of the clayey gravel above referred to was wheeled in with wheel scrapers.

The road bed from Veater's camp house to the Wilcox place, a distance of about one and three-fourths miles, was completed as outlined, and is a splendid piece of work. Four culverts have been put in along this stretch of ample capacity to take care of the flood waters in the washes. I regret to report that the plans for these culverts were ignored and much unnecessary concrete used. The retaining walls over the ends were left off all but one, and a few loose rocks piled up to keep the road bed from sloughing over the ends of the culvert. Some additions will have to be made to correct these errors before they will give satisfactory service.

The stretch above the canal north from Veater's was cut down nearly to grade and left unfinished, and that part of the road between Wilcox's and the top of the hill just north of Orton postoffice was untouched, leaving less than two miles of finished road and about three-fourths of a mile of road partially done, as a final result up to date. Mr. De Long informs me that the entire fund, \$2,500.00, available for this work, has been exhausted.

One of the things responsible for no better showing was a lack of proper equipment. I was informed when

I first went over this matter that the county did not have even a road plow. I advised the immediate purchase of such a plow, designating one that I knew to be satisfactory, and naming a Salt Lake firm that carried this plow in stock. I also advised that before any scraper team be put to work that not less than one-half mile of roadway be plowed, and that, then, only enough scraper teams be used so that the plow teams could keep plenty of dirt loosened for them to handle.

I visited the work again nearly a month later. A new road plow had just been received, and, on inquiry why this plow had not been obtained earlier, was informed that none of the merchants in Panguitch had an account with the Salt Lake company named, and they had been obliged to order a plow through a house outside of the State. In the meantime, work had been going on with whatever equipment could be picked up.

At the time of my second visit, even with a new plow also in operation, some of the scraper teams were riding their scrapers over the roadway and dumping sometimes a load, more frequently half a load, and sometimes scarcely any dirt at all. Attention was called to this matter and the foreman advised to lay off his scraper teams until enough dirt could be plowed loose so that they could work with better results.

On December 20, I again visited this part. I requested Mr. DeLong to send at once to the office, or to the State Road Commission, certain data on which to base a cost data report. As yet no report has been made on this matter.

Respectfully yours,

JOSEPH JENSEN.

(Dated December 28, 1910.)

IMPROVEMENTS IN KANE COUNTY.

Report of John F. Brown, Agent in charge of construction:

The road was begun at a point twelve and one-half miles northeast of Kanab at a point in the town of Johnson. I first constructed a crossing over what is called the Johnson Wash. I graded down the banks on either side and made a good easy grade in and out and built a strong culvert out of cedar posts and rock, making the culvert eight feet wide, five feet high and fourteen feet in length, covering the same with clay a depth of two feet. I was under the necessity of putting in forty-two loads of rock in order to make a good foundation on which to build. This crossing cost \$72.00.

I commenced to clay the sand beds along the road leading from Johnson to Kanab, commencing a distance of one-fourth of a mile from the crossing mentioned, cupping out the sand from four to eight inches deep and twelve feet wide, and filled in this depression with a very good quality of clay from four to ten inches deep, then covered the same with from one and one-half to two and one-half inches deep with sand, making the same twelve feet in width.

I cupped out and clayed in this way about three miles of the heavy sand, leaving now and then a little piece of road that was good in between. I made as good an estimate of the cost of construction as I could, and, from the figures, it cost from \$2.00 to \$5.00 per rod, depending on the distance hauled. I hauled clay from 200 yards to one and one-half miles. The teams would make from eighteen to twenty trips per day on the short hauls. I would load according to distance, grade and other conditions, from three to eight scrapers, but usually five scrapers to the wagon. I used No. 1 scrapers in loading; had my wagons fixed up with twelve and fourteen-foot plank, with twenty-inch side boards. I found it necessary to use extra long plank and high side boards to save dirt, both from slopping over in the loading pits as well as keeping the same from rolling off in transit.

I have clayed all of the heavy sand from Johnson to Kanab, with the exception of what we call the Big Sand Wash, two miles east from Kanab. I have a loading pit made and will start on that in the morning. After that is completed I shall turn my attention to fixing up the washes along the road between Kanab and Johnson, and I believe I will be able to put this stretch of road in first class shape the entire length.

As to the cost per mile, it will be somewhat difficult to make an estimate, for the reason that conditions were very different. The greater part of the road I have clayed I have been obliged to make long hauls. The cost has been from \$2.00 to \$5.00 per rod, that is, where I have put on from six to ten inches of clay. There was some little stretches where I put on but four loads per rod; where I did this, it would not cost to exceed \$1.00 per rod. The last day's run on the long haul it cost \$5.00 per rod. This haul was over one and one-half miles and six loads to the rod, fully eight inches deep, and twelve feet wide.

As to what has been done by the county by way of repairing the State roads, can only say that the county has not had an opportunity to do anything as yet. There has never been any split-log drags used on any roads in the county, to my knowledge, but I daresay they will be used in the future, for the reason we now have some stretches of road that will need it. I will say from what I have experienced from building road out of clay and covering the same with sand, it is a complete success; the sand mixes in with the clay and makes a good macadam, packing as hard as rock.

I am certainly sorry that I cannot furnish you with some photographs of the road at this time. It may be that I will be able to get some in the near future; if so, I will forward same.

The total cost of construction of what road I have completed is \$256.81. If you think best, when I get the road completed, I will furnish you with a detailed account of everything, but I cannot do so at present, but it will be some ten days before I will be through, as

I have some work to do that only one or two men can work at to advantage.

(Dated December 4, 1910.)

IMPROVEMENTS IN WASHINGTON COUNTY.

Report of Isaac C. Macfarlane, Road Commissioner:

The total length of road built is 4.16 miles. The width of the road for the first mile and a half, running south from the north boundary line of the county, is forty-four feet from the outside of the grade to the outside of the borrow pit; the balance of the road is thirty-eight feet wide. The road is situated along the foot of the mountain, the ground having a heavy slope to the west, with numerous washes crossing the road, ranging in depth from one to fifteen feet.

In order to keep the old road passable, it was necessary to repair after each storm by filling up the washes with brush, rock and earth, etc., which was washed out with each succeeding storm. I might add that there were hundreds of such washes that crossed the road before we built the new one. Therefore, the great problem in building a permanent road was to take care of the flood waters that came from the mountain during the heavy storms, which are quite frequent in this particular part. It was therefore necessary to construct twelve culverts, ranging in size from two to three feet square inside, and two bridges, one six and the other eight feet wide, sixteen feet long, and six feet high, in order to conduct the flood waters across said road. These culverts were located in the swales or low places in the road in order to gather all the water from the high points to the low places. It was necessary to construct flood ways or ditches from the upper side of said culverts, running each way and pointing towards the mountain, in order to give said flood ways sufficient fall to carry all the water that came from the said mountain, so that there is about as much distance in the flood ways as there is in the roads.

The culverts are made of three-inch plank, the sides lying horizontally, sixteen feet long, with strips of two by six plank up and down, two feet apart, spiked firmly to the sides to hold them in place, and the tops and bottoms of the boxes are made of three-inch plank, put on crosswise and well spiked to the sides.

The boxes are placed in the bottom of the wash or cuts made for that purpose across the road, with a large cedar post on the outside of each corner set in the ground five feet below the bottom of the wash or cut, and about two feet in width of plank are spiked onto the post crosswise of the box for the ends of said box to rest on and to prevent the water from running under the said box. Then there are wings about five feet long, made of plank, at the upper end of the culvert or box to prevent the water from running round the sides; then cedar lagging is placed on the top of the wings and across the ends of the box and built up to the level of the road bed to hold the earth, then the box is covered with earth to the level of the road. Gravel was hauled and the trench in front of said culverts was filled up to the level of the bottom of said culverts as an extra precaution to prevent the said culverts from being washed out. With these precautions, so successful were we in constructing the culverts that, although twelve culverts were put in without water, when the first heavy storm came, only one culvert was affected at all and that very slightly.

In building the bridges we had a trench dug on each side of the wash, six feet below the bottom and four large cedar posts set up in each trench for the ends of the bridge to rest on. The trenches were then filled with rock to hold the posts in place. Cedar lagging was then built in behind said posts from the bottom of the wash to the level of the bridge, which was about six feet above the wash; also, wings were built of posts and cedar lagging at the upper and lower sides of the bridge to prevent the water from washing around, caps were placed on the posts for the end of the stringers to rest upon, and the floor of the bridge was made of three-inch plank, with good, substantial railing along each side.

The road is of earth turnpike, twenty feet wide, with borrow pit twelve feet wide, with twelve-foot berm be-

tween turnpike and borrow pit; this is for the first mile and a half, running south from the north boundary line of the county. The balance of the road has the same width of turnpike and borrow pit, but only a four-foot berm; the borrow pit is from two and a half to six feet deep, and the grade in the center is from two to six feet high. A part of the road was built through boulders and gravel formation, and we had to use considerable powder in breaking large boulders. The clearing of the right of way was quite an item of expense, as a great many cedar trees and stumps, as well as scrub oak and serviceberry brush had to be grubbed and removed from the right of way.

The object of taking all the earth from one side to build the grade was to make a good big borrow pit or ditch on the upper side of the road to carry off the water that accumulated between the flood way and the grade.

The only kind of road made was of earth, and no surface material other than that found long the line of the road was used. The total cost for the 4.16 miles of road was \$2,568.79; the

Cost of bridges and culverts	\$ 650.00
Cost of grading and flood ditches	1,900.00
All other expenses	18.79
	\$2,568.79

Cost of grading and flood ditches, per mile, \$456.73.

Considerable cuts and fills were necessary in order to give the road a proper grade.

The road was finished October 9, 1910. Since the completion of the road it has been damaged by floods to the amount of \$10.00.

The road has been dragged with the split-log drag twice after storms, at a cost of \$5.00 each time. The cost of dragging was increased by reason of the road being so far from the settled portions of the county.

Owing to the absence of a photographer from the county, we are unable to send you any photographs of

the road before or after construction. I send you maps under separate cover.

There is one wash that runs across the said road (Dry Creek), that would require a bridge thirty feet in length, but owing to the impossibility to get the necessary lumber to make the bridge at the time of building the road, no bridge was made, and in order to make the road complete there should be a bridge constructed across this wash.

(Dated December 13, 1910.)

IMPROVEMENTS IN IRON COUNTY.

Report of H. M. Hendrickson, Road Commissioner:

The State road construction commenced at the county line between Iron and Washington Counties, south of the town of Kanarra, near the southeast corner of Section 16, Township 38 South, Range 12 West, and extended two-thirds of a mile in a northerly direction. The road is thirty feet wide with a ten-inch crown, is made of earth, and is rolled with a steam roller. Drain ditches running the entire length of this piece of road, large enough to take care of all water that may accumulate along the road, have been made.

The other piece of road constructed commenced at the east end of the lane running west from Parowan, along the section line between Sections 15 and 22, Township 34 South, Range 9 West, two and a quarter miles to the northeast corner of N. W. $\frac{1}{4}$ of N. W. $\frac{1}{4}$ of Section 12, Township 34 South, Range 9 West. This portion of the road is forty feet wide, with a thirteen-inch crown, made of earth and rolled with a steam roller. There is a plank culvert under this road near the corner of Section 16, made of three-inch plank, one foot deep by two and a half feet wide and thirty-two feet long, requiring 462 feet of plank to construct it.

The road then runs south from the end of the lane forty rods, and thence continues in a southwesterly direction a distance of three miles. This part of the road is



COUNTY ROAD BETWEEN SUMMIT AND PAROWAN, IRON COUNTY.

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thirty feet wide with a twelve-inch crown, made of earth and rolled with a steam roller. There are two culverts on this section; one is near the four-mile post, made of two three-inch planks, two feet four inches wide by one foot eight inches high by sixteen feet long; the other is one-fourth mile west of five-mile post, and is made of three-inch plank, three feet wide by two feet deep and is sixteen feet long, with abutments fourteen feet long on the west side and eight feet on the east, four feet high, made of cedar posts and plank. Eleven posts and 500 feet of plank were used in its construction.

The cost of construction is \$477.08 per mile. I am unable to give the exact amount required to construct the different widths of road, as I had it under construction at the same time. There has been over \$1,100.00 spent by the county in repairing and protecting the road designated as a State road, but none has yet been spent on that part graded and finished, as none has yet been needed.

I have used the split-log drag to some extent on earth roads and think it a first class tool, and consider that the drag and roller are the only successful means of keeping up earth roads. While the work was in progress on the grading of the roads, two heavy storms came, and where the road had been rolled it stood the storm fully as well as the old road, whereas if it had not been rolled it could not have been travelled at all.

In my opinion, for this county, roads should be thirty-five feet wide with twenty-foot crown, as I consider thirty feet with sixteen foot top too narrow; on ordinary ground, where the ground is dry, I think six to eight-inch crown sufficient, and in wet or boggy places about twelve-inch crown would be about right.

I will endeavor to get some photographs of the road as finished and some which have not been graded, and send to you.

The road so far is practically finished, but a little more money will have to be used in dragging and finishing up the edges and uneven places, as the travel makes it necessary.

I have on hand 1,166 feet of three-inch plank, one cedar post, and ten pounds of spikes.

(Dated December 13, 1910.)

SUMMARY.
State Road Built During 1910.

COUNTY	Graded Miles	Graded Cost per Mile	Surfaced with Gravel or Stone Miles	Surfaced with Gravel or Stone Cost per Mile	Sand Clay or Clay Miles	Sand Cost per Mile	Total Miles	Total Expended	REMARKS
Beaver.....	4.781	\$ 298	.892	\$ 1,394	.....	.....	5.673	\$ 2,670	.....
Box Elder.....	3.25	1,000	.75	2,000	.....	.....	4.0	4,750	.....
Cache.....	.....	.....	2.25	2,500	.....	.....	2.25	5,625	.....
Carbon.....	No Report	.....	.....	.....	.....	.....	.....	3,000	.....
Davis.....	.....	.....	1.173	3,903	.....	.....	1.173	4,578	.....
Emery.....	16.0	165	.....	.....	.....	.....	16.0	2,633	.....
Garfield.....	2.25	888	.....	.....	.....	.....	2.25	2,500	.....
Grand.....	6.25	400	.....	.....	.....	.....	6.25	2,500	.....
Iron.....	6.0	500	.....	.....	.....	.....	6.0	3,000	.....
Juab.....	3.25	800	.75	1,800	.....	.....	4.0	3,950	.....
Kane.....	.....	.....	.....	.....	3	833	3.0	2,500	.....
Millard.....	15.5	224	.....	.....	.....	.....	15.5	3,470	.....
Morgan.....	2.0	.....	.....	.....	.....	.....	2.0	3,500	.....
Plute.....	5.0	400	.....	.....	.....	.....	5.0	3,130	.....
Ritch.....	4.0	.....	.....	.....	.....	.....	4.0	6,400	.....
Salt Lake.....	.....	.....	.57	5,000	.....	.....	.57	3,000	.....
San Juan.....	Scattered; largely repair work.	.....	.....	.....	.....	.....	.....	2,500	.....
Sanpete.....	6.055	822	.....	.....	.....	.....	6.055	4,158	.....
Sevier.....	7.5	380	.....	.....	.....	.....	7.5	2,500	.....
Summit.....	1.25	2,800	.....	.....	.....	.....	1.25	3,500	.....
Tooele.....	3.50	.....	.....	.....	.....	.....	3.50	.....	.....
Uintah.....	6.0	532	.....	.....	.....	.....	6.0	3,195	.....
Utah.....	1.9	550	3.42	1,640	5.13	640	10.43	10,913	.....
Wasatch.....	Very scattered;	.....	.....	.....	.....	.....	.....	3,000	.....
Washington.....	4.16	459	.....	.....	.....	.....	4.16	2,559	.....
Wayne.....	No Report	.....	5.53	3,196	.....	.....	5.53	17,673	.....
Weber.....	.....	.....	.....	.....	.....	.....	.....	1.14 Mile Macadam.	.....
Average cost per mile, \$802.00								125,424	\$100,631

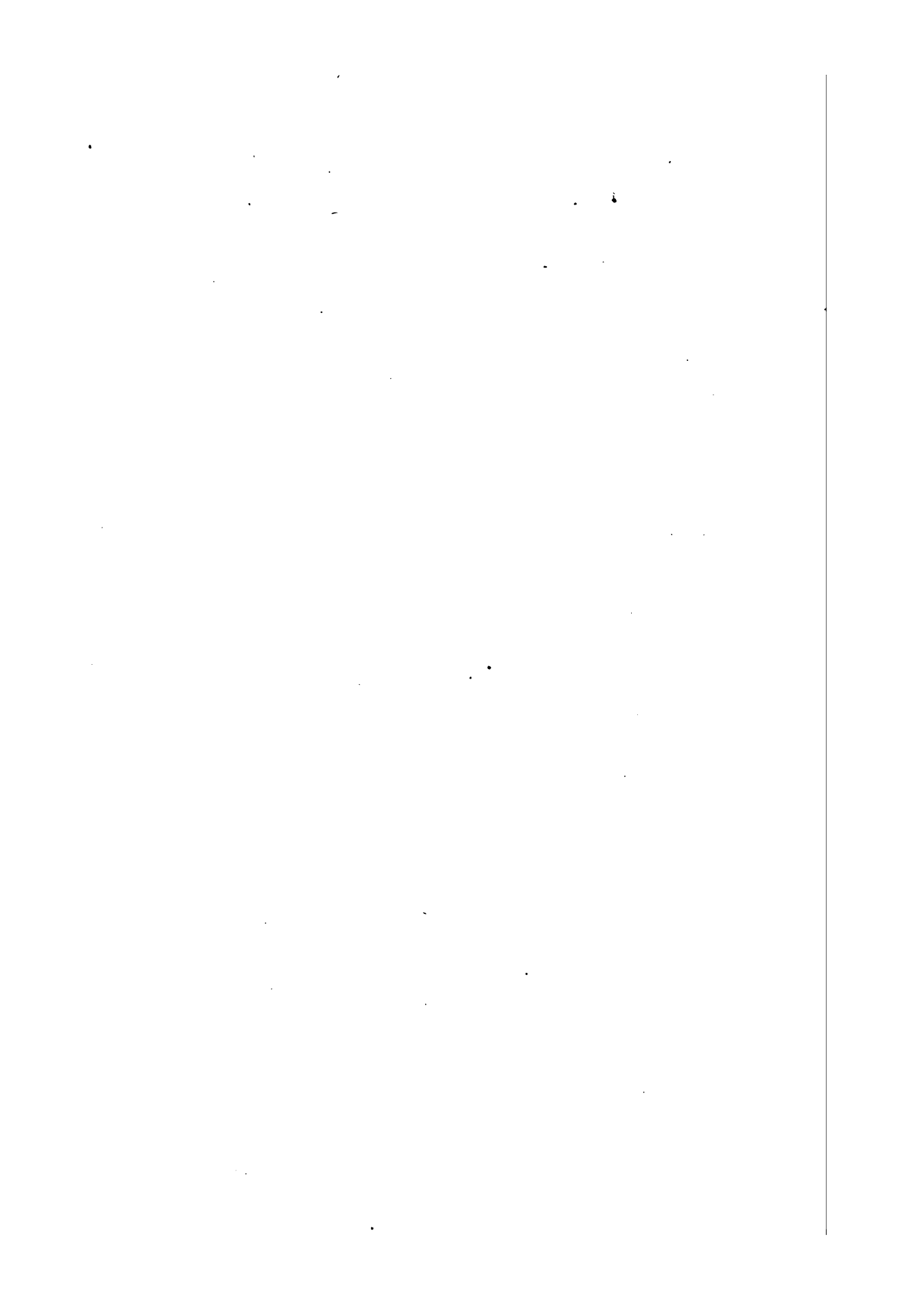
Very respectfully submitted,

CALEB TANNER,
Secretary State Road Commission.

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Engineering News
19 June 1913

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Second Biennial Report

OF THE

State Road Commission

TO THE

Governor of Utah

For the Year 1911 and 1912

VID. 311

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Utah Road Commission

8850

Second Biennial Report

OF THE

State Road Commission

TO THE

Governor of Utah

For the Year 1911 and 1912

THE ARROW PRESS
Tribune-Reporter Printing Co.
Salt Lake, Utah
1913

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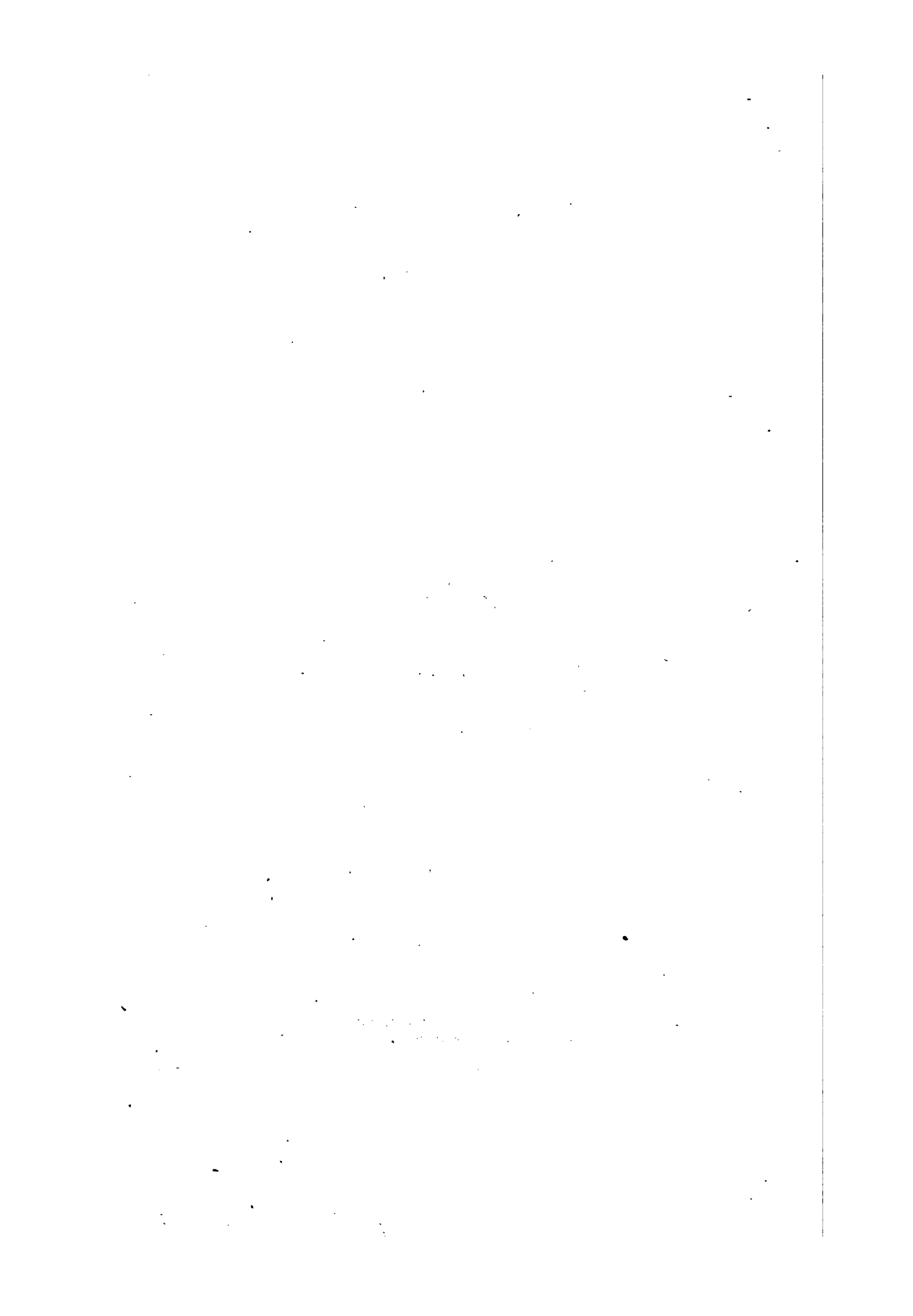
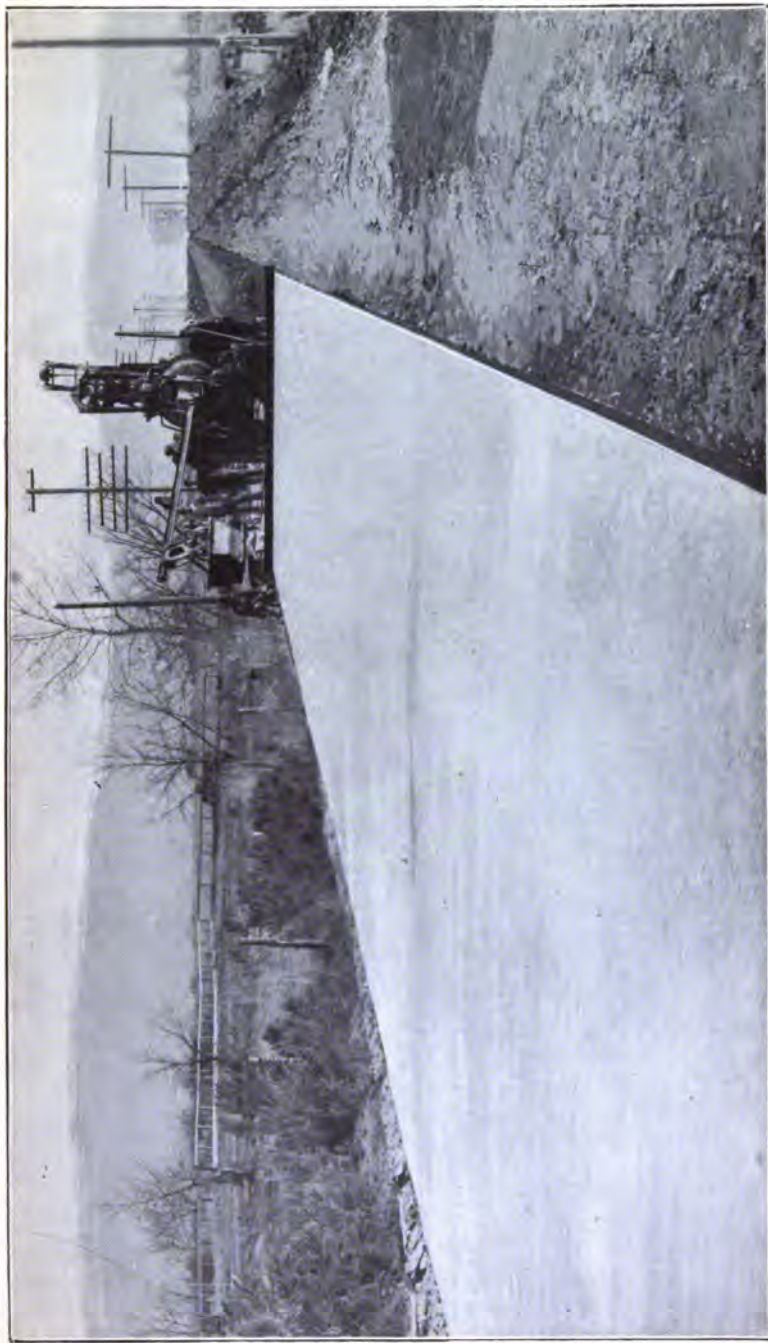


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A Type of Concrete Road that is Fast Coming into Popular Favor.

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Letter of Transmittal

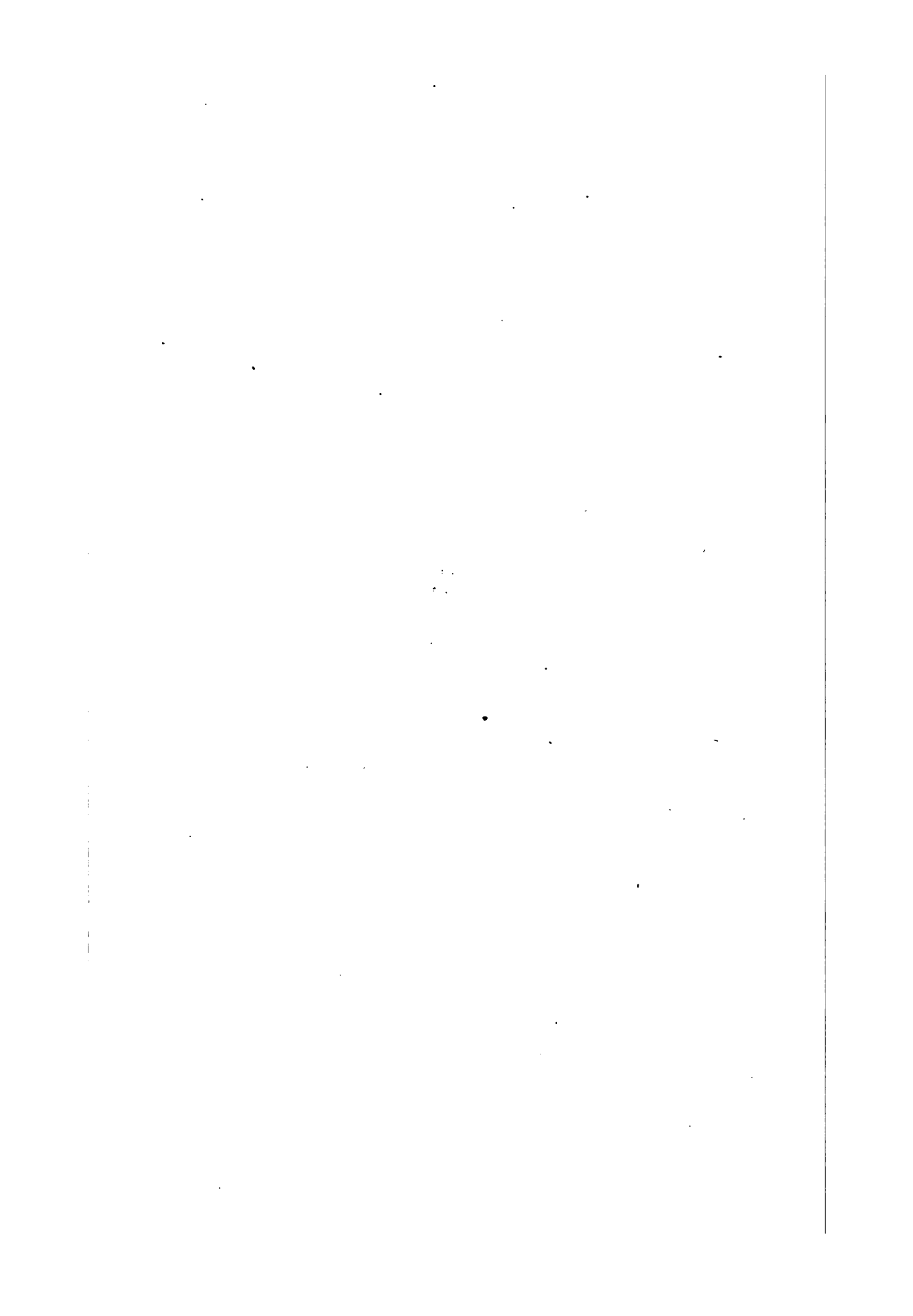
William Spry, Chairman.
Richard R. Lyman, Vice-Chairman.
Caleb Tanner, Secretary.
David Mattson, Commissioner.
J. W. Jensen, Commissioner.
W. D. Beers, Road Engineer.

Salt Lake City, Utah, November 30, 1912.

Honorable William Spry, Governor of Utah:

Sir: In accordance with Section 1, Chapter 119, Session Laws of Utah, 1909, the Second Biennial Report of the State Road Commission is herewith submitted.

WILLIAM SPRY, Chairman.
CALEB TANNER, Secretary.



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Gravel and Shale Road Construction in Juab County.

Second Biennial Report of the State Road Commission

General Statement

The arrangement that was made to supervise State Road Construction in 1910 was still maintained in 1911 and 1912. For this purpose Rich, Cache, Box Elder, Morgan, Summit and Juab Counties being under the jurisdiction of J. W. Jensen; Richard R. Lyman having Salt Lake, Utah, San Pete, Sevier, Millard and Beaver; Weber, Wasatch, Uintah, Carbon, Emery, Grand and San Juan being assigned to David Mattson; and Wayne, Piute, Garfield, Kane, Washington and Iron Counties being given to Caleb Tanner. The appointment of construction foremen, the designation of additional State roads in the several counties, the naming of precincts in each county where State Road Work was to be done, the type of construction to be used, and the business or local taxation was left largely in the hands of the Commissioner to whom the County was assigned.

In May, 1911, as provided in Chapter 76, Section 5, Session Laws of 1911, the Commission appointed W. D. Beers as State Road Engineer. Since his appointment Mr. Beers has had general charge of all the engineering work on the State Roads, and in addition thereto the road work of the convicts has been under his immediate control.

The method of carrying on the work of the Commission as given above has been, generally speaking, successful, and has produced good results, the mileage of road constructed is greater and the type of the construction better than anything we have had heretofore. At the termination of three years

of active operation the sentiment for road improvement is better than it ever has been before, and the extent of improved roads built in this period many times more, than the accomplishment of any other equal interval of the past.

As might have been anticipated, the actual operation of the law has shown weakness in some features, and the desirability of considerable modifications in other features in order that the greatest amount of improvement might be made with the least waste of time and effort.

The character of construction in all the counties has been kept as high as conditions of our finances would permit. Practically all road structures installed on State roads during the last three years have been built of stone, iron or concrete, and whenever necessary and economically practicable the turnpike has been covered with a wearing surface that would add to the life of the road and make its service better.

During the biennium, as the tables will show, 501 miles of road have been constructed at a total cost of \$570,009.30. This expenditure covers drainage systems incident to the construction of the road and all the bridges and culverts used—making an average cost per mile of \$1,137.00. The several types of roads built, together with the cost of each type per mile, can be determined by reference to the tables accompanying this report.

The interest, assistance, and the loyal support which the counties have given to the State Road work is particularly encouraging. The Commission is under the greatest obligation to the Commissioners of the several counties for the success that has attended the road building movement. The splendid local response that the State has met supports the contention that the vitality of the law does not rest so much upon the matter of State aid as upon the fact that it provided a means, not practicable before, for the local communities of the State to improve their wagon roads.

Box Elder County largely through the impetus given to the good road movement by the good road measures, has bonded the county for \$200,000 for the construction and improvement of its roads. Summit County has raised from local

sources \$47,577 for State Road work during 1911 and 1912, while the State has only been able to contribute to the county \$14,000. Such local responsiveness to a needed improvement is of such striking merit that it deserves your attention and commendation, and to this we may add that such local response is only typical of what our counties are doing and seem willing to continue to do, in forwarding this road movement.

While many of our smaller counties, like Kane and Rich, have not the resources to contribute to road work the great sums that the more populous counties have given, their interest is just as encouraging, and their contributions in proportion to their resources as large—the maximum amount which the law provides. In the light of these facts should not the State go forward with this good road plan, increasing the State aid for this work from time to time and as a consequence increasing the aid coming from the counties, until the roads of our Commonwealth, upon the condition of which so much of our material prosperity depends, shall be placed on a par with our other institutions; to increase in this desirable effort so far at least that the roads of the State will have their fair share of State attention and of State revenues, that our roads may be raised out of the mud in same reasonable ratio with our other advancement.

The convicts have been used upon the State Roads almost continuously since the passage of the law making provision therefor. During 1911, a stretch of macadam road was built in Box Elder County; in the winter of that year they did construction work in Washington County. In the summer of 1912 they built a considerable mileage of road in Davis County and laid a pipe line for road sprinkling purposes. They are now employed on some very difficult road work in Washington County situated between Anderson's Ranch and Belview. Wherever the convicts have been used the prejudice against their use which was at first encountered has been entirely overcome. Their work has been highly advantageous to the State and should be continued. The appropriation made by the last Legislature for the convict work was not sufficient for the Warden to use all the convicts that might have been

sent out of the prison for this purpose. To obviate the recurrence of this disadvantage an appropriation should be made sufficient to place all available convicts out on the road.

On stretches of heavy work the convicts can be most advantageously and economically used. There are many such places in the State on State roads. In some such places our funds are so limited that unless provision is made for the use of the convicts, which gives us very cheap construction, some stretches of such road must remain unimproved for many years to the grave disadvantage of the State. A detailed statement of the work of the convicts in 1911-12 is given in subsequent pages of this report.

RECOMMENDATIONS.

1st. It is recommended by the Commission that our laws be amended so that the Commission will have authority to determine the conditions under which the roadway space on State roads may be occupied for any purposes.

2nd. To make the special road tax in precincts where State Road work is to be done, five mills.

3rd. To recast the SPECIAL ROAD DISTRICT law so as to make it an effective measure.

4th. To pass a comprehensive vehicle tax law.

5th. To enact a wide tire law.

6th. To modify the law governing the expenditure of State Road funds so that the State Road funds might be concentrated in the hands of the State road Commission and disbursed by the authority of the Commission.

7th. To provide a State Road equipment fund of at least \$40,000.00 to buy equipment for State Road work—this fund to be a revolving fund—the depreciation of equipment purchased and the rental thereon while in use being charged against the county where the equipment was being operated. The sums derived from the several counties by these charges to go back into the equipment fund to be used for buying new equipment and replacing equipment that has been worn out. \$14,614.15 of said above appropriation to be credited to the appropriation of 1911 and 1912,

as carried by Section 6, Chapter 42, Session Laws of Utah, 1911, for equipment purchased in 1911 and 1912, and charged to said appropriation.

8th. To appropriate \$40,000.00 for the use of the convicts on the roads as provided by Chapter 76, Laws of Utah, 1911.

9th. To appropriate \$196,400.00 for the State Road Fund for 1913 and 1914.

10th. To create a special State Road construction fund to be used for building the most enduring types of road that will carry successfully the heaviest traffic; such types as concrete, bituminous macadam and asphalt, etc. This special construction fund to be used under the direction of the State Road Commission in the construction of such types of road as specified above on State Roads where conditions and traffic warrant. Under the limitation that the county or counties where such types of road shall be built must supply at least 50%, and may be required if so ordered by the State Road Commission, to contribute as much as 75% of the cost of such concrete, asphalt, or bituminous macadam road, etc., for this purpose an appropriation of \$100,000.00 is recommended.

REPORT OF THE OFFICE WORK DURING THE BIENNIUM 1911-1912.

W. D. Beers, State Road Engineer.

With the creation of the State Road Commission in 1909, the Legislature provided that all records, maps, profiles, and papers pertaining to State road work be kept in the offices of the State Engineer. With this provision went also, as a natural consequence, all office work that might be necessary in carrying on the work of the Commission. Under such arrangements, the office end of the Road work was started and carried on, in and by the office of the State Engineer.

In 1911, the Legislature realizing the importance of the State road work, provided for the appointment of a State Road Engineer, and a Chief Clerk. Accordingly, in May of that year, the Commission appointed W. D. Beers State Road Engineer, and in October of the same year, appointed William H. Rowe Chief Clerk.

With the growing demands for better roads, in conjunction with the businesslike policy that the Commission had adopted for the carrying out of State Road improvements, the office work began to increase in such proportions that the necessity of establishing an office apart from the State Engineer's office soon became apparent. Realizing this, the Commission, in November, 1911, secured office rooms in the Felt Building, and the Road Engineer began the organization of the office end of this work.

The work was divided into two general departments, namely, the Clerical and Engineering Departments. Under the Clerical Department was included the work of keeping all accounts, cost records, checking up bills, pay rolls, preparing vouchers, etc., and doing all stenographic work that might be required; while under the Engineering Department was included the work of preparing all estimates, plans, specifications, profiles, and such other engineering work as was required to carry on the construction work on the State Roads.

One of the first questions that presented itself in the organizing of the Clerical Department was the instituting of a system of accounting and cost keeping that would be adapted to our special needs. With this end in view, Mr. A. J. Hughes of the U. S. Reclamation Service was secured to devise such a system.

In the system adopted the main books of record are the General Ledger, Cost Ledger, Voucher Register, Appropriation Ledger, General Classification Book, and Equipment Book, all other books and forms being auxiliary records.

In the classification of accounts, the number system is used, and the different classes of construction work are

segregated into their component parts, and each part is given an account number. When a State Agent is instructed to begin construction work, a set of account numbers is furnished him covering the particular piece of work, also "Time Books," "Notice of Purchase" blanks, "Material and Supplies Used" blank, and a form to be filled out at the end of the month showing the amount of work done.

The Time Book is a time and cost keeping book for all labor. It consists of loose leaves placed in a binder, which is small enough to be carried in the coat pocket. The sheets are so arranged that spaces are provided for account number after each man's name, and the different account numbers can be inserted as necessity demands, and the time can then be marked up daily after the account number. At the end of the month the State Agent totals up each man's time, filling in the amount in a space provided, removes the sheets from the binder, certifies to their correctness, and mails them to the State Road Commission office.

In purchasing small orders, it is the rule of this office to ask for bids from the various dealers handling such material. These bids are placed on file, and the order given to the lowest responsible bidder.

On all contract work, notice of intention is published ten days prior to the opening of bids, which are opened in public by the State Road Commission, who lets the contract to the lowest responsible bidder according to plans and specifications.

When an order is placed by the office, it is written up in triplicate with full shipping instructions. One order goes to the successful bidder, one to the State Agent, and one is retained as an office copy. The State Agent, on receipt of goods, checks off articles with his copy of order and then, by a special postal card notifies this office of the condition of shipment. The account is then handled direct from this office.

In case the State Agent makes a purchase, he is required to fill out a Notice of Purchase blank. This blank

gives the name and address of the person from whom the purchase was made, the date, and an itemized list showing the articles purchased. He is also required to get an itemized bill from the Claimant before the end of the month, approve same for payment, attach it to the Notice of Purchase, and mail them to the office at the end of the month. This is required so that bills will be handled promptly. Previous to demanding this of our Agents, many bills were presented eight to twelve months after the purchase was made, and Agents could hardly be expected to remember the details of the order.

At the end of every month the State Agent is required to fill out a Material and Supplies blank showing the amount and cost of the different materials used, together with their account numbers, showing what jobs the material is to be charged to. In connection with this method, a set of bin cards are used at the State Road Commission office, showing the amount of material purchased, the distribution, and the amount on hand, so that an accurate record of all material can be kept.

At the end of each month, the State Agent mails to the State Road office all time sheets, Notice of Purchase with bills attached, Material and Supplies used, with a report of the amount of work done. On receipt of the above accounts, they are checked up, and the cost of labor and material and supplies entered in the cost ledger. With this system we will be able to state the cost of any piece of construction work under way up to the end of the previous month.

If time books are found correct, a pay roll is written up, showing the names of parties working, occupation, number of hours worked each day, the rate of pay, the amount earned, the deduction, if any, and the amount due. The Road Engineer certifies to its correctness as Engineer in Charge.

All bills are checked with the Notice of Purchase or with the office order. The claims are then written up on a special blank (called a voucher) prepared by this office, and mailed to the claimant, who signs same in duplicate

before a notary, and returns them to this office. The Road Engineer then certifies to the correctness of the claim, as Engineer in Charge. The pay rolls and vouchers are then approved by the State Road Commissioner of the particular county and passed for payment by the State Road Commission at a regular meeting. They are then posted up in the Voucher Register, and one copy sent to the State or County Auditor for payment, the duplicate being kept for our office files.

All bills that are incurred in connection with the State Road work are paid for either from State or County State Road funds; in the first case upon requisition on the State Auditor, and in the second case on a requisition of the Engineer in Charge on the County Commissioners of the particular county where work was done, the requisition to be approved by the State Road Commission. There are no regulations to follow in the classification of the bills for payment, however, this office tries to follow the rule of paying all local bills in the county from County State Road funds, and all bills incurred in this office through the State Auditor. The pay rolls are paid from both funds. In case a pay roll is paid from State funds, a requisition is made on the State Auditor for the total amount of the pay roll, in favor of the County Treasurer. The State Auditor forwards the warrant to the County Treasurer of the county in which the pay roll was incurred, and the County Auditor, who has received a duplicate copy of pay roll, acts as the disbursing agent and draws a warrant for each claimant on pay roll.

During the biennium 1911 and 1912, 2485 pay rolls and vouchers, amounting to \$570,006.30, have been paid through the clerical division of this office, besides handling a voluminous correspondence. As the system now in use was not installed until June, 1912, we are unable to give detail cost for the biennium, but will be able to show detail cost on all future work, and by so doing will be able to keep in close touch with the construction work.

In the organizing of the engineering department of this office, we have had an entirely different problem to face than that in the clerical department. Here it was mainly a question of systematizing designs and specifications according to modern engineering practice, and the preparing of standard plans for bridges and culverts that would be suitable for the different conditions and localities in which they might be required. At the same time we had to take care of all the engineering that was necessary in connection with the construction work under way. This latter work has taken up most of our time so that little has been done toward the standardizing of plans and specifications, although considerable time has been spent studying the methods of the various highway commissions throughout the country, and much information on this subject has been collected.

During the past ten months in which the engineering department has been established, the following plans and specifications have been prepared in connection with the construction work carried on in the various counties.

Bridges.

- 6 steel truss bridges, ranging in length from 30 to 62 feet
- 7 I-beam steel bridges, ranging in length from 12 to 22 feet.
- 2 concrete bridges, one 20-ft. span and one 10-ft. span.
- 2 wood truss bridges, one 48-ft. span and one 30-ft. span.
- 13 wood stringer bridges, ranging in length from 8 to 25 feet.

Culverts.

- 8 concrete, box-type culverts, ranging in size from 2x2 ft. to 9x5 ft.
- 16 concrete, open-type culverts, ranging in size from 2x4 to 10x6 ft.
- 1 rock culvert, size 4x4 feet.

Miscellaneous.

Plan of abutments for bridge over Weber River at Oakley.

Plan of abutments for bridge over Provo River at Heber.

- Plan of standard inverted syphon.
- Plan of standard road harrow.
- Plan of sprinkling system in Clearfield, Davis County.
- Plan of sprinkling system in Centerville, Davis County.
- Profiles of State Road in Davis, Rich, Summit, Sevier, Sanpete, San Juan, and Washington counties.

Various standard road cross-section plans, etc.

In addition, this department has made surveys of bridge sites, inspected the material and construction of bridges, sprinkling systems, abutments installed by contract, checked up and passed upon such plans as have been submitted by the various counties for road construction purposes, prepared estimates of cost, compiled road laws, etc.

In connection with designing of bridges and culverts, it was deemed advisable to make a study of the rapid increase in the weight of the various road rollers and traction engines in use. With this end in view, communications were addressed to the leading manufacturers of road rollers and traction engines, asking them to submit to us weights and dimensions of their standard makes. This information was then tabulated, and from the results obtained a theoretical loading was adopted which would conform as near as possible to the results of the table. This loading is used for the designing of all culverts and bridge floors. For the truss system of any bridge the loading of 100 pounds per square foot for spans up to 150 feet in length is used. For all spans above this, a loading of 75 pounds per square foot is used.

There are various types of culverts used in connection with the construction of roads in the different counties. In general, for culverts up to 24 inches in size, cement or corrugated iron pipe is used, although corrugated iron culverts up to 60 inches in diameter have been used in some of the counties.

In the designing and construction of reinforced concrete culverts, two general types have been adopted, namely, the box type, and the open type. The former is used in places where the bearing foundation of the soil is poor, while the

latter is used in places where it is good. The footings of all culverts are carried down at least two feet below stream bed and farther if necessary, and baffle walls are put across the ends of all culverts to minimize the chances of the structure being washed out. Wherever rock is found in the vicinity, that is suitable for culvert construction, it is preferred to the other types on account of its cheapness. This office does not recommend the construction of wood culverts under ordinary conditions.

In the actual construction of roads, one of the first requirements of this office is that an accurate profile of the road be taken. This profile, together with the type of road cross-section adopted will determine the grades and amount of material that will have to be moved. The profile notes, after being taken in the field, are platted up and sent to this office, where the topography of the road is studied and a grade line determined. In establishing this grade line, we try to make the cuts and fills balance as nearly as possible. After the grade line is established, a copy of the profile is returned to the Engineer in Charge of the field work, who then can tell the exact cut or fill at any part of the road to be improved. This profile will also aid the field engineers in laying out the road drainage and locating culverts.

As stated before only little has been accomplished up to date in the standardizing of plans and specifications, although there are on file standard plans of several structures, such as inverted syphons, road harrows, several bridges, etc. We also have standard specifications for steel bridges, wood pipe and concrete construction. At present we are working upon a system of standard culvert plans. All maps, plans, specifications and records are filed and indexed, so that easy access can be had to them at any time.

**REPORT OF THE WORK DONE BY CONVICT LABOR
DURING THE BIENNIUM 1911-12.**

By W. D. Beers, State Road Engineer.

In 1909 the Legislature of Utah provided that prisoners in the State Prison could be placed to work on the roads in the State, under the regulations made by the State Board of Corrections, and that the State Board of Corrections should furnish the Board of County Commissioners of any county, on application of said Commissioners, not less than 15 nor more than 50 convicts to work on county highways of such counties. Convicts to be at all times under the supervision and control of the State Board of Corrections. Counties making an application for the convicts should comply with any requirements made by the State Board of Corrections. As there was no financial aid provided in this law for the maintenance of prisoners, there were no prisoners used on the road construction during this biennium.

In 1911 the laws were changed to read as follows:

CONVICT LABOR.

Chapter 76, Session Laws 1911—Use of Convicts and Prisoners in Construction of Roads.

Section 1. Convicts and prisoners may be required to work upon State roads. That convict labor may be utilized in providing material for constructing roads and also in the construction and improvement of roads, the prisoners in the county jail may be required to work upon county roads under regulations made by the Board of County Commissioners and prisoners in the State prison may be required to work upon State roads.

Section 2. Control of convict labor. When State Prison convicts are used in the construction or improvement of any State road the work shall be under the authority and control of the State Road Commission, the State Board of Corrections and the Warden of the Utah State Prison, subject to the provisions of Section 5 of this Act.

Section 3. Supervision of work. The supervision of the State road work provided for in this Act shall be under such competent persons as may be selected by the State Road Commission, provided that no supervisor shall cause or permit any person under his direction to be employed for more than eight hours of any day.

Section 4. Powers of State Board of Pardons. The State Board of Pardons shall have power and they are hereby authorized to adopt rules and regulations providing for the granting of privi-

leges to prisoners and employees upon State roads, public buildings and public grounds which shall especially provide for the granting of additional reduction of sentence for good behavior, such reductions to be conditions upon their good behavior and efficient work while employed on State roads, public buildings and public grounds.

Section 5. State Road Commission to designate when work shall be done. State roads upon which convicts are to be used shall be located and surveyed by and under the direction of the State Road Commission, who will designate from time to time the particular section or sections of said roads which shall be constructed or improved.

When any section of State road has been selected for construction or improvement the State Road Commission shall cause plans and specifications covering the construction or improvement of said road to be prepared, and in designating the material to be used in said construction or improvement the State Road Commission shall take into consideration the climate, soil, materials, to be had and the extent and nature of the probable traffic on said road with a view to the most economic construction consistent with efficiency.

The State Road Commission may appoint a road engineer whose salary shall be fixed by said Commission and who shall have in addition thereto his actual and necessary traveling expenses while actually engaged in the discharge of the duties of his office, which salary and expenses shall be paid by the said Road Commission out of the State Road fund, from the portion of said fund which is available to the County in which the work is done by warrants of the State Auditor, or by the County Commissioners of the County where the work is done, upon requisitions issued by the State Road Commission.

On or before the tenth day of every month the said road engineer shall certify to the State Road Commission the number of days of service rendered and the expenses incurred by him during the month next preceding, which certificates shall separately state the items of service and expenses rendered and incurred in respect to said State road in each county through which the same may pass.

Section 6. Right of Way. The County Commissioners of the several counties of this State are hereby authorized and required to secure the right of way for any State road in the location designated by the State Road Commission in accordance with the laws of the State now in force or which may hereafter be enacted relative to procuring right of way of public roads.

Section 7. Bridges and Culverts. All bridges and culverts required in connection with this road construction shall be built under the supervision and in accordance with plans approved by the State Road Commission, and so far as is deemed advisable, shall be constructed by convict labor.

Any material necessary to be purchased for said bridges and culverts shall be paid for by the State Road Commission, out of the State Road fund, from the portion of said fund which is available to the county in which said bridges and culverts are located.

Section 8. Appropriation. The sum of twenty thousand dollars is hereby appropriated out of any moneys in the State Treasury not otherwise appropriated, payable upon vouchers of the Warden of the Utah State Prison, approved by the State Board of Corrections, upon warrants drawn by the State Auditor for the purpose of

paying the necessary extra guards and foreman and for the purchase of tools, implements and blasting material, supplies and equipment necessary in the prosecution of said work and for transportation.

All purchases of tools, implements, blasting materials and supplies and equipment primarily for road building use, shall be approved by the road engineer appointed by the State Road Commission.

Section 9. **Repeal.** Chapter 96, Laws of Utah, 1909, and all acts and parts of acts in conflict with the provisions of this act are hereby repealed.

Section 10. This Act shall take effect upon approval.

On May 15, 1911, the State Road Commission employed W. D. Beers as State Road Engineer and instructed him to visit Davis County and arrange to start the convict work. He visited the county and made a thorough investigation of the road problem with the following results:

First: That the entire State Road, with the exception of about two or three miles, would have to be graded.

Second: The grading would be mostly team work.

Third: That with the present traffic an earth road could not be made to stand up, but after grading it should be surfaced with some good gravel or stone.

Fourth: That a thorough investigation should be made as regards suitable material for surfacing before the Commission proceeds to expend any great amount of money on this type of construction.

Fifth: That in case prisoners worked on the State Road in Salt Lake, Davis, Weber or Box Elder Counties, some equipment would have to be purchased and that if the convicts were moved to Box Elder County the County Commissioners there could furnish part of the equipment, as they were building a macadam road between Hot Springs and Willard.

On June 10th the State Road Commission met with Warden Pratt and the Davis County Commissioners to discuss the above report, and after a lengthy discussion it was practically decided to commence operations with the coinverts in Box Elder County, insomuch as it was deemed advisable to start in a place where part of the equipment was already available. Warden Pratt reported that during the biennium 1911 and 1912 it would take all of his available

funds for guarding and buying camp equipment for feeding and housing the prisoners. On June 13th, at a meeting of the State Road Commission, the Road Engineer was authorized to purchase equipment for use on the State Road and the following equipment has been purchased to date:

PRISON CAMP EQUIPMENT.

- 21 work horses (2 have died since).
- 1 saddle horse.
- 10 sets heavy double harness and 3 sets of lead lines.
- 1 set light double harness.
- 6 cart harnesses, complete.
- 3 extra collars.
- 1 saddle and bridle.
- 1 horse tent 25x56; 1 wall tent 10x12, 12 oz.
- 3 Weber wagons, 3½.
- 1 Studebaker wagon, 3½.
- 4 Studebaker 2-yard dump wagons.
- 1 Winona wagon, 3½, with cover.
- 1 Whitetop wagon.
- 6 dump carts.
- 1 sprinkler, 600-gallon, wood.
- 2 sprinklers, 600-gallon, steel.
- 1 road roller, 15-ton, Springfield-Kelly.
- 1 12-barrel water tank with steel running gear.
- 1 grader.
- 1 Smith concrete mixer, ¼-yard capacity.
- 5 Fresno.
- 2 slip scrapers.
- 1 tongue scraper.
- 2 No. 3 Western plows.
- 1 No. 5 Western plow.
- 1 carpenter outfit, complete.
- 1 blacksmith outfit.
- 1 shoeing outfit, complete.

In addition there were purchased nosebags, halters, currycombs and brushes, lead bars, horse blankets, shovels, manure forks, stock and dye, buckets, sledgehammers, claw hammers, han daxes, picks, mattocks, wagon jacks, monkey wrenches, pipe cutter grindstone, log chains, screw jack, crowbars, rock rakes, etc.

This equipment cost \$14,614.15.

In the handling of the prisoners throughout the bien-nium, Warden Pratt or his head guard has been responsible for the conduct of the prisoners and the amount of the work done on the State Road. The State Road Commission,

through their Engineer and Construction Superintendent, has directed the work and are responsible for the equipment purchased by them.

CONVICT CAMP NEAR WILLARD, BOX ELDER COUNTY.

In the establishment of a camp about one and one-half miles south of Willard, an area of about five acres in an open place near good water was secured by the County Officials for use of the convict camp, and on July 17, 1911, the camp was established.

The camp was so arranged that the prisoners' kitchen, dining and sleeping tents were enclosed within a barb wire stockade 125 feet square, the fence being 10 feet high with 4x4 posts set every eight feet, with wire spaced every four inches. Near the top of the posts a 2x2x2 ft. 6 in. strip was spiked and projected over into the stockade, and on this arm three wires were strung, so that in case a man tried to scale the fence he would have a very hard time in getting over the top. The prisoners were guarded night and day, and while they were in camp two guards were on duty at opposite corners of the stockade. At night carbide lamps were used to light the fence line.

In the building of the water-bound macadam road, which was 14 feet wide and 8 inches deep, the construction consisted of the following:

First: Collection of cobble stones and rock from hillsides and carting same from one-eighth to one-half miles to crusher.

Second: Crushing rock and boulders.

Third: Hauling crushed rock from 0 to 3 miles in two-yard dump wagons.

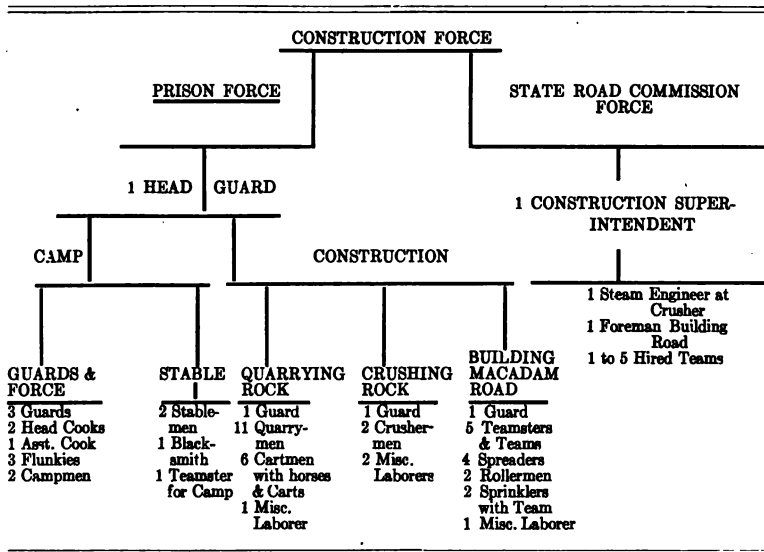
Fourth: Spreading rock.

Fifth: Rolling and sprinkling.

Sixth: Shaping of berms and drainage ditches.

Three guards were used on this work and the Construction Superintendent was given an assistant who worked with the spreader and roller men. In addition to the convict labor it was found necessary at times to hire additional

teams to assist in doing the team work. The following diagram gives the method of organization:



The force worked on this piece of work until November 13th, when the weather got so bad that they were taken back to the State Prison. They were in Box Elder County 119 days, and during that time they graded one-fourth mile of earth road, one-eighth of a mile of rock and boulders, which required blasting, and built $2\frac{1}{4}$ miles of macadam road, at a cost of \$2054.00 per mile. The following is the cost of the work:

Rent of equipment through Box Elder County...	\$ 495.00
Supplies—	
Coal, powder and rent of water for sprinkling, etc.	937.09
Hired help	1887.49
Stable expenses—	
Supplies	\$110.87
Veterinary	34.00
Grain	492.35
Hay	664.49
	<hr/>
	\$1301.71
	<hr/>
Total	\$4621.29

THE ASTOR LENOX TILDEN FOUNDATION
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Convict Camp Near Willard, Box Elder County.



**Convicts Collecting Stones for Crusher, Near Willard,
Box Elder County.**



**Convicts Constructing Macadam Road at Hot Springs,
Box Elder County.**



**Macadam Road Completed, North of Hot Springs,
Box Elder County.**

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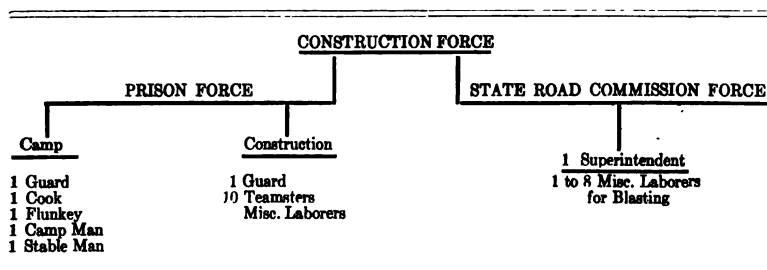
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The horses and equipment remained in Box Elder County until December 18, 1911, as the State Road Commission and the State Board of Corrections were unable to come to an understanding in regard to moving the prisoners to Washington County. After numerous meetings of the two Boards it was decided to send the teams, wagons, scrapers and all small tools to Washington County, and the Board of Corrections were to send two guards and 20 prisoners; that they were to stay in the county about 100 days and that the State Road Commission was to subsist them. The State Road Commission bought the necessary groceries needed, and on December 18th shipped the equipment and groceries to Lund over the S. P., L. A. & S. L. Railroad. Due to a strike of the mechanics on the railroad, the equipment did not reach Lund until December 26, and due to being side-tracked for long periods of time, the teams were in very bad condition when they arrived.

On December 27, 1911, the prisoners arrived at Lund and proceeded to Middleton, Washington County, where they arrived January 1, 1912, and pitched camp, the trip taking fifteen days, and costing the Commission \$546.19.

CONVICT CAMP IN WASHINGTON COUNTY.

During the time that the convicts were in Washington County, 108 days, the force was organized as follows:



As will be noted, the men were not guarded closely, as no guarding was done at night. No men tried to escape during their stay in the County. When the work was started near St. George on the construction of a 30-ft. graded road,

it was learned that none of the prisoners had done any of this kind of work and that each man had to be shown how to handle the different tools. While they were at Willard their work had been of a simple nature, and did not require nearly as much instruction as they required in using the grading tools. The men, after the first month, were able to do good work and improved during the time they were in this camp. The work consisted of grading, 2.9 miles of sand and topping same with clay and the grading of one mile of dugway. In the blasting of the dugway hired labor was used.

The following is a statement of the expenditures on road constructed in Washington and St. George precincts:

Transportation of equipment from Willard to Middleton, Washington County.....		\$ 546.19	
Engineering and laying out the road.....		57.25	
Supplies for road—			
Powder, caps, fuse, etc.		228.15	
Hired labor, superintendent and laborers.....		1315.71	
Cost of camp—			
Lights and fuel	\$217.72		
Foodstuffs	926.01	1143.73	
Cost of stable—			
Supplies, horseshoes, etc.	\$ 41.04		
Grain	941.74		
Hay	678.69	1661.47	
Total cost			\$4952.50

The cost of this work varied from \$500.00 to \$3000.00 per mile.

The following tables give the cost of subsisting the prisoners per meal. As will be noted in December, 1911, the cost was 22 cents per meal. This high price was due to the fact that during December the camp was being moved from Lund to Middleton and that a great deal of canned goods and meats were used and all breakages and losses in transit were charged to the expenses for this month. The cost of subsistence for the eighteen days for April is not shown, as no report was made.

REPORT OF SUBSISTENCE
(December, 1911.)

Article	Unit	Quantity	Unit Price	Cost
Sapolio	Cake	1	\$00.07	\$00.07
Ivory soap	Cake	20	.04	.80
Nickle Plate soap.....	Cake	6	.02¾	.17
Soda	Pkg.	1		.06
Compound	Pounds	30	.0896	2.69
Baking powder.....	Pounds	4	.11	.44
Sego milk	Cans	20	.07	1.40
Sugar	Pounds	48	.0723	3.47
Beans	Pounds	20	.0588	1.18
Flour	Pounds	200	2.43	4.86
Coffee	Pounds	20	.2633	5.27
Tea	Pounds	1	.27	.27
Rice	Pounds	3	.06	.18
Ham	Pounds	86	.14½	12.47
Salt sides	Pounds	121	.10½	12.70
Coal oil	Gallons	5	.2763	1.38
Beef	Pounds	115		15.43
Coal	Pounds	500	.009	4.50
Telegraph matches				
Vinegar				
Castile soap				
Pepper				
Mustard				
Mayflower Oats				
Salt				
Total				\$67.34
309 meals at a cost of.....				\$67.34
Average cost per meal.....				.22

REPORT OF SUBSISTENCE
(January, 1912.)

Article	Unit	Quantity	Unit Price	Cost
Baking power	Pounds	15	\$00.11	\$ 1.65
Beans	Pounds	34	.0588	2.00
Butter	Pounds	12	.25	3.00
Coffee	Pounds	29	.26 1-3	7.63
Coal oil	Gallons	13	.2762	3.59
Coal	Tons	6838 lbs	15.00	51.28
Coal hauling				1.50
Wood hauling				6.00
Eggs	Dozen	12½	.25	3.10
Flour	Pounds	800	2.43	19.44
Raisins	Pounds	23	.08	1.84
Peaches, evaporated	Pounds			
Apricots	Pounds			
Lard and compound	Pounds	50	.0896	4.48
Lye	Cans	6	.10	.60
Beef	Pounds	1230	.0628	77.24
Pork	Pounds	77½	.10	7.75
Pork	Pounds	71	.09	6.39
Hams				
Salt sides	Pounds	92	.10½	9.66
Milk	Gallons	21	.20	4.20
Matches	Boxes	15	.009	.14
Oatmeal	Pounds	10	.0423	.42
Rice	Pounds	31	.0613	1.90
Soda	Pkgs.		.06¼	
Soda crackers	Pounds	19	.10	1.90
Syrup	Gallons	6	.48	2.88
Sugar	Pounds	122	.0723	8.82
Salt	Pounds	25	.0173	.43
Castile soap	Cake			
Sapolio	Cake	2	.07	.14
Ivory soap	Cake	2	.04	.08
Nickle Pate soap	Cake	62	.02¾	1.78
Allspice	Can	1	.12	.12
Cloves	Can	1-3	.05	.05
Cinnamon	Can	1	.12	.12
Cocoanut	Pkg.	1	.20	.20
Ginger	Pkg.	1	.35	.35
Hops	Pkg.	½	.10	.05
Lemon				
Mustard	Pounds			
Nutmeg	Pkg.	1	.12	.12
Pepper	Pounds	½	.22	.11
Sage	Pkg.	1	.10	.10
Vanilla				
Yeast	Cake	1	.05	.05
Tea	Pounds	4	.2662	1.06
Toothpicks	Box	1	.05	.05
Vegetables—				
Beets				
Cabbage	Pounds	118	.02½	2.95

Article	Unit	Quantity	Unit Price	Cost
Cabbage	Pounds	75	.03	2.25
Carrots	Pounds	59	.01½	.88
Onions	Pounds	43	.02½	1.07
Parsnips	Pounds	67	.02½	1.67
Potatoes		50	.01½	.75
Potatoes		1296	.01¾	22.68
Potatoes		224	.02	4.48
Radishes				
Turnips				
Vinegar	Gallons	1	.23	.23
Total				\$269.10
2363 meals served during January at a cost of.....				\$269.10
Average cost per meal.....				.11

REPORT OF SUBSISTENCE
(February, 1912.)

Article	Unit	Quantity	Unit Price	Cost
Ivory soap	Bars	5	\$00.04	\$00.20
Lye	Cans	7	.10	.70
Sapolio	Bars	1	.07	.07
Soda	Pounds	1	.06½	.06
Toothpicks	Boxes	1	.05	.05
Matches	Boxes	9	.009	.08
Mustard	Pounds			
Pepper	Pounds	½	.22	.11
N. P. soap	Bars	22	.02¾	.60
Vinegar	Gallons	1	.33	.33
Carrots	Pounds	15	.01½	.23
Salt sides	Pounds	172	.10½	18.06
Sugar	Pounds	148	.0723	10.70
Beans	Pounds	38	.0588	2.34
Rice	Pounds	36	.0613	2.21
Coffee	Pounds	26	.2623	6.82
Tea	Pounds	4	.2662	1.07
Raisins	Pounds	3	.08	.24
Raisins	Pounds	22	.10	2.20
Flour	Pounds	700	2.43	17.01
Oatmeal	Pounds	20	.0423	.84
Salt	Pounds	50	.0173	.87
Cabbage	Pounds	108	.02½	2.70
Cabbage	Pounds	125	.03	3.75
Onions	Pounds	72	.02½	1.80
Compound	Pounds	11	.0896	.99
Coal oil	Gallons	12	.2762	3.31
Coal oil	Gallons	2	.40	.80
Syrup	Gallons	7	.48	3.36
Baking powder	Pounds	5	.11	.55
Ginger	Pounds	½	.35	.17½
Crackers	Pounds	20½	.10	2.05
Milk	Gallons	29	.20	5.80
Hops	Pkg.	½	.10	.05
Eggs	Dozen	12	.25	3.00
Eggs	Dozen	51½	.20	10.30
Butter	Pounds	13	.25	3.25
Cloves	Pkg.	2-3	.15	.10
Nutmeg	Pkg.	1	.12½	.12½
Allspice	Pkg.	1	.12½	.12½
Cinnamon	Pkg.	1	.12½	.12½
Beef	Pounds	1154	.06	69.24
Pork	Pounds	130	.09	11.70
Potatoes	Pounds	1403	.02	28.06
Coal	Pounds	5000	15.00	37.50
Wood	Load	1	5.00	5.00
Wood	Cord	½	6.00	3.00
Dried corn				2.40
Dried apples	Pounds	25	.12	3.00
Pickles				.80
Total				\$267.73
2094 meals served during the month of February at a cost of \$267.73				
Average cost per meal				.12¾

REPORT OF SUBSISTENCE
(March, 1912.)

Article	Unit	Quantity	Unit Price	Cost
Baking powder	Pounds	7	\$00.11	\$00.77
Beans	Pounds	53	.0588	3.12
Butter	Pounds	10	.25	2.50
Butter	Pounds	4	.30	1.20
Coffee	Pounds	29	.28	8.12
Coal oil	Gallons	8	.40	3.20
Coal oil	Gallons	6	.37	2.22
Wood				30.50
Eggs	Dozen	10.55	.15	1.58
Flour	Pounds	700	2.43	17.01
Raisins	Pounds	29	.08	2.32
Apples	Pounds	25	.12	3.00
Compound	Pounds	9	.0896	.81
Lye	Cans	2	.10	.20
Beef	Pounds	418	.06	25.08
Beef	Pounds	245	.065	15.92
Pork	Pounds	554	.09	49.86
Salt sides	Pounds	144	.105	15.12
Milk	Gallons	31	.20	6.20
Matches	Boxes	37	.009	.33
Oatmeal	Pounds	80	.0423	3.38
Rice	Pounds	30	.0613	1.84
Soda	Pounds	1	.0625	.06
Crackers	Pounds	25½	.10	2.55
Syrup	Gallons	7	.48	3.36
Sugar	Pounds	82	.0723	5.93
Sugar	Pounds	69	.085	5.86
Salt	Pounds	35	.0173	.61
Castile soap	Cake			
Sapolio	Cake	4	.07	.28
Ivory	Cake	5	.04	.20
Nickle Plate	Cake	10	.0275	.28
Diamond C	Cake	25	.043	1.07
Allspice	Pkg.	¾	.15	.10
Cloves	Pkg.		.10	
Ginger	Pounds	½	.35	.18
Mustard	Pounds		.29	
Pepper	Pounds	0.25	.22	.06
Sage	Pkg.	1	.10	.10
Tea	Pounds	4	.2662	1.06
Toothpicks	Box		.05	
Onions	Pounds	53	.025	1.33
Green onions				1.00
Potatoes	Pounds	1018	.02	20.36
Vinegar	Gallons	1	.33	.33
Carrots	Pounds	65	.015	.98
Canned fruit	Case	1	3.00	3.00
Total				\$242.97
2239 meals served during the month of March at a cost of \$242.97				
Average cost per meal.....				.11

On April 19, the force started for Davis County, and when they arrived in Cedar City all the prisoners but seven were taken to Lund and transported to the prison. The teams were driven through, reaching Salt Lake City May 1, taking thirteen days for the trip. On May 12th a permanent camp was established 1½ miles north of Layton and 48 convicts were placed at work. The method of handling the prisoners was the same as in Box Elder County, the prisoners being guarded day and night. The Board of Corrections, on the establishment of the camp in Davis County, assumed the responsibility of subsisting the prisoners.

CONVICT CAMP IN DAVIS COUNTY.

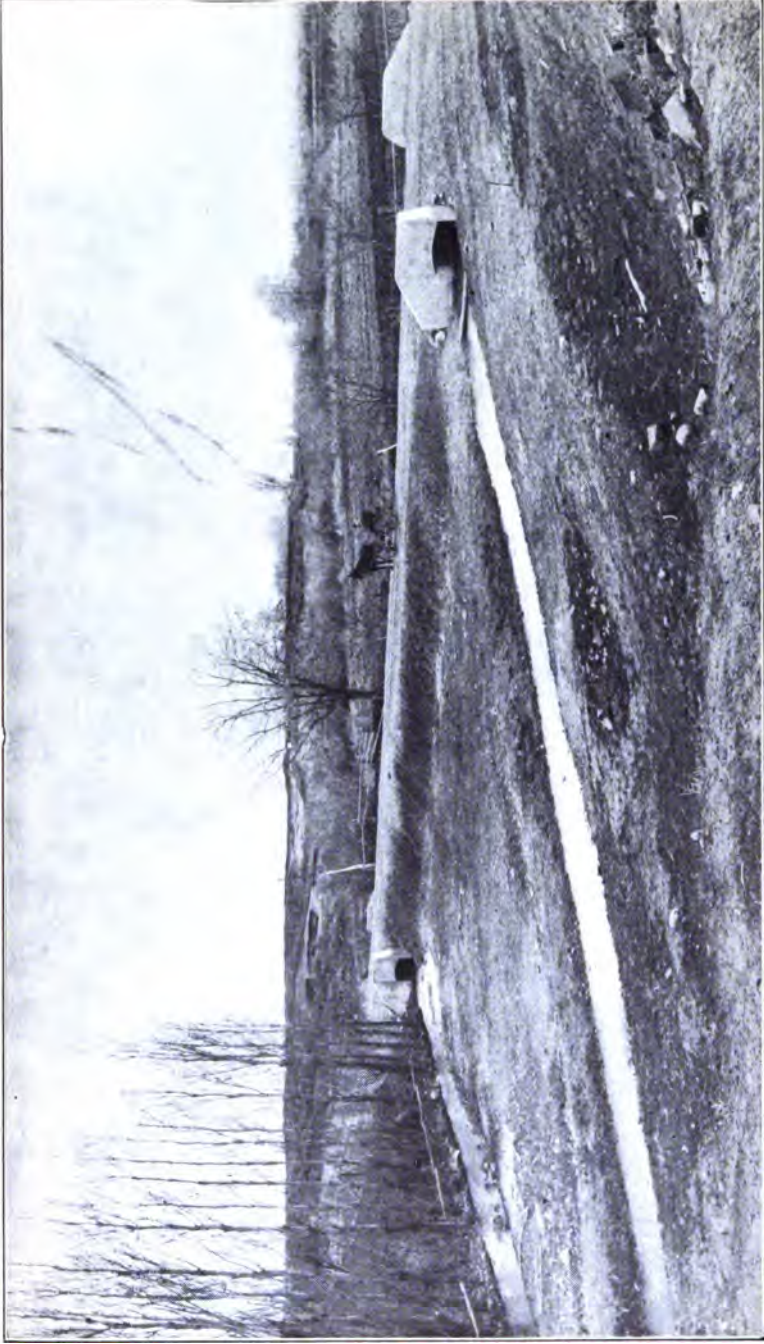
The work of the convicts in this county consisted of the following:

Construction of 5.2 miles of sprinkling system. In this work the convicts dug a trench 5.2 miles long with an average depth of 3.5 feet, and laid the pipe one-half of the distance and back-filled the entire trench. When the laying of the pipe was started, it was thought that a force of skilled pipe-layers could lay the pipe faster and better than the convicts, so four men were hired, but after about one-half of the work was completed they were let out and the convicts finished the work in a satisfactory manner. In the digging of the trench, considerable water was encountered, which would have made the work very expensive had hired labor been used.

During the time the sprinkling system was being installed the teams, with the necessary convicts, graded 2.45 miles in the Clearfield and Layton precincts, and surfaced one-half mile of clay road with a sand clay top 8 inches deep.

On the completion of this work the camp was moved to the north part of the Centerville precinct, and worked until October 22d in the Centerville and Farmington precincts. This work was very heavy, as it was a boulder and cement formation and required a great deal of single hand work and considerable blasting. Some heavy team work was done in this section. In these two precincts 2.55 miles

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Culverts on State Road Between Stockton and Tooele, Tooele County.



State Road Between Stockton and Tooele, Tooele County.

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It will be seen from the above that the people are in favor of the good roads movement and are willing that their property should be taxed in order to get better roads. If this condition is to continue it is very essential that the money thus raised must be well expended and as large a percentage as possible be expended for permanent improvement.

In this district of seven counties 473 miles of State road have been designated; of this number of miles 117.6 miles have been constructed, 40 miles of which is earth road construction, and the balance of 77.6 miles have been carefully graded and then surfaced with either gravel, shale or broken stone, and one piece of concrete road extending from Tremonton to Garland, Box Elder county.

It gives me pleasure to state that the day of the wooden bridge or wooden culvert has largely passed in the construction of State roads in Utah. Without exception, in the above district, the culverts and bridges have been made of either steel, stone masonry with cement joints, or concrete, all of which should give service for generations. This will eliminate the necessity of a large percentage of the funds, raised for road construction, being expended for the repair and replacement of perishable structures. It is the opinion of the writer that the earth road, in the more thickly populated sections of the State, must in the very near future, go the way of the wooden culvert and the wooden bridge. In many parts of our State today it is wasteful to attempt to make the earth road serve the requirements of the traffic on the main highways. Under conditions of heavy traffic the earth road is probably the most expensive road that can be built and maintained. The question naturally arises what type of road can be built of reasonable cost that will serve all classes of traffic and have a low maintenance requirement.

The broken stone or macadam road has been constructed to some extent in parts of the State, and when well constructed, gives a very good road. The macadam road, however, needs considerable attention by way of maintenance and especially should be sprinkled in our dry climate, in the

summer season, which is often a difficult thing to do in parts of our State.

The concrete road has gained much favor in certain parts of the country within the last few years and in many parts of our State has a great many things in its favor. The bulk of material from which good concrete can be made is to be found in most localities. Most of the work can be done by local help, and in this way by using local material and local help the money expended on this type of road remains in the community paying for the improvement. The concrete road serves all classes of traffic well; it is a permanent type of construction and its cost of maintenance is also low. Where sand and gravel can be had within a three-mile team haul, a single driveway concrete road should be constructed for from \$5,000.000 to \$8,000.00 per mile. The concrete road between Tremonton and Garland is fast gaining favor by those who use it.

A detailed statement of the work that has been done in each of the above counties can be found elsewhere in the report.

In conclusion let me urge a liberal appropriation by the present Legislature to stimulate and continue this hearty co-operation on the part of the people of the different counties toward this most important and much needed improvement. The sentiment in favor of good roads in the State of Utah today is excellent and should continue, and I predict it will continue if the State does its part. In the past two years for every dollar the State has appropriated for State roads, the counties have supplied one dollar and fifty cents in the district above mentioned. It appears to me that the State cannot do better than encourage such co-operation and support.

January 15, 1913.

State Road Commission,
Salt Lake City, Utah.

Gentlemen: In reply to your request I submit the following general statement of the work done on the State roads in the counties in which, as a member of the State Road Commission, I have general direction of State Road work.

Since statistics and other details, with respect to this work, have already been prepared by Mr. W. D. Beers, State Road Engineer, the report I am submitting will be of a very general character.

Very truly yours,

(Signed)

RICHARD R. LYMAN.

BEAVER COUNTY.

The State Road work in Beaver county has been done under the direction of Mr. August Thiessen. A large portion of the funds available for State Road work in this county, has been spent on the road between Beaver and Milford for the reason that this road is the outlet from the county to the railroad, and over it practically all the people of the county do more or less traveling, and nearly everything shipped into or out of the county goes over this road.

There is an excellent opportunity here for studying practically all phases of earth-road construction and maintenance. East of Milford the road passes through a low swampy country, where the clay, when wet, is unusually soft and sticky. Beyond this point, going toward Beaver the road is located close to the foothills, and the material of which it is composed has in it enough fine gravel and material with cementing qualities to produce an earth road of unusual excellence. The road in this neighborhood was not expensive to construct. Only a comparatively small amount of storm upon it, and a comparatively small amount of dragging, so packed the surface of this road, as to put it in first class condition. Once in good condition the road sheds water well, it resists a comparatively heavy traffic, the cost of maintain-

ing is light, and since but few clods or ruts are formed upon it, it rarely, if ever, becomes so dusty as to make traveling inconvenient or uncomfortable.

Because of the great range in the kind and quality of material with which this thirty-two or thirty-three miles of earth road has been built, it affords an excellent opportunity for studying the service various kinds of earth roads will render under different kinds of treatment. Here an opportunity is presented for determining whether an earth road of very poor material can be maintained with sufficient care, and at a reasonable cost, to resist the traffic to which this particular highway is subjected. An opportunity is also given for determining how small will be the cost of maintaining that portion of this highway that is composed of earth-road material of unusually good quality.

DAVIS COUNTY.

In Davis county that method has been pursued which the writer regards as being best under the conditions there existing. An exhaustive study of the stone in Davis county that is available for road construction, and also of the stone in the neighboring counties available for this same purpose, was made, and was used as a basis upon which to determine whether or not a macadam road should be built. A copy of the report upon the cost of macadamizing the State Road through this county follows at the end of this discussion.

At a comparatively small cost these tests were made, and the conclusion reached that there is no stone available for this construction of such quality as to warrant making the expenditure of money that its use requires, until the funds available for State Road work in the county are greater than they were at the time this investigation was made.

Since, however, an earth road is the beginning of the construction of all the better types of road, the conclusion was reached that the money available for State Road work in Davis County would be spent most wisely, if, with it, the best earth road were built from one end of the County to the other, that can be made with the earth-road material to be found

along the right of way. Now that a road of this sort is practically completed, it is proposed, as the funds for so doing become available, to construct, beginning in those places where the earth road is of such a nature as to need most to be replaced, a thoroughly modern tarred-macadam, concrete, or asphaltum road, which ever those concerned regard as best, when taking into account the traffic to be resisted and the funds available for doing the work.

**REPORT UPON THE COST OF MACADAMIZING THE
STATE ROAD THROUGH DAVIS COUNTY.**

W. D. Beers, State Road Engineer.

**E. H. Beckstrand, Director of Laboratory for Testing
Road Material, U. of U.**

ROCK.

In the selection of a suitable stone to be used in the macadamizing of the Davis County road it is first necessary to decide on some of the general characteristics that a suitable stone for such purpose should possess—the consideration of such general characteristics to be determined largely by the traffic which the road must carry. In estimating the kind and amount of traffic passing over the road between Salt Lake and Ogden we consider that the road is carrying about an average amount of heavy vehicles such as would be found existing between what would be called two medium sized cities in the Middle West and East. The amount of traffic carried by this road is not the most that could be placed upon a road, but is, however, sufficient to warrant and require the construction of a road made from good material. Of course, it is always advisable to use a local stone, provided one of suitable quality can be found.

In looking for a suitable stone we have had in mind a rock that would be strong and resistant to the grinding action of wear and also a rock that would withstand considerable impact, also a rock whose rock dust when ground to a powder will, on wetting, adhere strongly to itself and to the pieces underneath it.

The wearing strength of rock is determined from tests made in certain standard abrasion cylinders, the test for abrasion having been standardized by the American Society for Testing Materials, and consists of taking samples of the rock, of such size as are used in building the road and placing them in cylinders, and subjecting the rock in this way to a certain quantity of abrasive wear. The amount of rock dust which will pass through $\frac{1}{8}$ " mesh sieve is considered worn material, and is used in estimating the percentage of wear and the coefficient of wear. The condition of the remainder is estimated by the

eye as to whether it has broken down into smaller pieces or whether the original pieces remain intact. The percentage of wear used here has reference to the ratio between the weight of material which passes through $\frac{1}{8}$ " mesh sieve to the total weight of the sample. A test sample consists of 5 kilogram weight, which is a fraction of an ounce over 11 lbs. The co-efficient of wear is obtained by taking the weight which passes the $\frac{1}{8}$ " mesh sieve in grams dividing by the total number of kilograms in the original sample and dividing that into 400. This number has been used by all road testing engineers as a measure of the wearing quality or value of the rock. A rock which is suitable for moderately heavy traffic such as we find on the road between Salt Lake and Ogden should have a co-efficient wear of about 10.

A method of estimating the punishment a rock can stand due to impact without breaking into smaller pieces is by taking an average piece of the rock, grinding it into a cylinder about 1" in diameter and 1" high, and then subjecting it to the impact of a 2 kilogram hammer, increasing the height of fall after every impact by one centimeter. The number of blows received before this cylinder breaks is a measure of its impact resisting power. A rock for use on such a road as the Davis County road, in our opinion, should have a toughness of at least 10 impacts. There is no acceptable method for determining the cementing value of the rock dust, so that this quality can only be estimated roughly by studying the behavior of the rock dust on wetting. The percentage of absorption of water by the rock is also another aid in judging the weather-resisting power of a rock. The smaller the percentage of absorption of course the better the rock will be enabled to resist the disintegrating action of the weather.

Quartzite is a very hard rock and resists the action of the weather. Its percentage of wear is usually very small, but on account of its rock dust lacking in binding and cementing power, this rock is not a satisfactory rock for the wearing course of the road. Limestone is usually a soft rock, and shows a very large percentage of wear where heavy traffic is carried. This rock, however, is usually good in cementing and binding powers. Limestone of the older geological kind often carries considerable silica mixed through it which serves the good purpose of making the rock much harder, with correspondingly less wear due to abrasion. Granite and gneiss are hard rocks with usually poor binding quality. These rocks are all found in the hills and mountains east of the Davis County road.

Our search for a suitable stone consisted of a personal inspection of the quarries and also the selection by us of the samples which were tested. We began by investigating the ledges and quarries from the Warm Springs northward following the foothills through Davis County and into Weber County, up the Weber river as far as the Cement plant at Devil's Slide, then into Ogden Canyon, up as far as the Weber County crushing plant. We also investigated the rock in Eimigration Canyon. Silicious limestone is found along the hills from

Parley's Canyon on beyond the Warm Springs. East of Bountiful and beyond, following the hills, outcroppings of quartzite and gneiss are found all the way through to Ogden Canyon. In Ogden Canyon limestone carrying silica is found in great quantities, between large beds of quartz. This limestone is very silicious, hard and tough. Farther east in Weber Canyon, near and around Morgan City is found limestone of the softer variety.

Samples No. 1, 2 and 3 are limestone which were taken from what is known as the Hancock Quarry, located in Salt Lake County, about $1\frac{1}{4}$ miles from the Davis County line, near the Warm Springs.

Samples No. 4, 5 and 6 were taken from what is known as the Melon Quarry. This quarry is situated near the power house, about $\frac{1}{4}$ mile from the Davis County line. From this point the hills were followed to Bountiful Canyon, there being no ledges exposed and no samples were taken. The canyons east of Bountiful were followed up to where ledges were exposed. The distance from the State road to these ledges is about 2 miles. In these canyons the ledges are mainly quartzite, difficult to get to.

East of Farmington and Kaysville the rock formation is chiefly gneiss. Nos. 7 and 8 were taken east of Kaysville.

Samples No. 9, 10, 11, 12, 13, 14 and 15 were taken from the quarries near Morgan City and from the quarries at the cement plant at Devil's Slide.

Samples No. 16, 17, 18, 19, 20 and 21 were taken from Emigration Canyon.

Samples No. 22, 23, 24 and 25 were taken from the old slag dumps at Sandy and Murray.

Samples No. 26, 27 and 28 were taken from the Farr Limestone quarries in Ogden Canyon.

Also samples No. 31, 32 and 33 were collected from the limestone quarries near the Farr lime kilns.

Samples No. 40 and 46 were obtained by re-sampling the more silicious part of the limestone east of the Farr quarry. These samples were taken from the part of the quarry on which the option was obtained.

The following table shows the results of the tests as obtained in the laboratory on the various samples:

Number	Coef. of Wear	Per Cent of Wear	Toughness	Per Cent of Absorption	WHERE FROM
1	9.63	4.15	15	.11	South end of McDuff Quarry.
2	8.09	4.80	17	.1	McDuff quarry, taken from place where checks were in rocks.
3	9.84	5.24	12	.3	South end McDuff quarry, where medium checked.
4-5	9.01	9.20	9	.54	Melon quarry.
6	2.73	15.30	12	.70	Melon quarry, near powder house.
7	6.32	6.30	7	.76	Taken from ledge east of Kaysville, near gravel pit.
9	5.80	7.00	5	.30	From crusher at cement plant.
10	6.37	6.08	13	.71	150 feet east of crusher at Devil's Slide.
11	8.42	4.60	14	.32	From high quarry, 25 feet, and west of crusher at Devil's Slide.
12	9.23	4.30	15	.84	Combination sand and lime, 150 feet west of crusher.
13	6.74	5.80	8	.03	One-half mile east of Morgan meeting house.
14	8.50	4.60	7	1.02	Morgan Co-op. quarry.
15	6.36	6.29	8	.90	Morgan Co-op. quarry.
16	5.12	7.82	11	.50	From Emigration Canyon, Eagle Rock Point, near road.
17	4.72	8.50	10	.55	Emigration Canyon, 200 feet above road from cliff.
18	9.33	4.29	9	.22	Emigration Canyon, Eagle Rock, near road.
19	8.82	4.54	12	.56	Emigration Canyon, broken stone in quarry.
20	9.65	4.14	8	.75	Emigration Canyon, rock in quarry.
21	6.64	6.02	5	.50	Emigration Canyon, rock in quarry.
22	8.42	4.70	7	.55	Slag from old smelter at Sandy, north side of dump.
23	10.29	3.89	11	.55	Old smelter, Sandy, west side of dump.
24	9.17	4.25	8	.52	Old Germania smelter, near road.
25	7.50	5.33	10	.48	Old Germania smelter, north dump, near railway station.
26	9.59	4.11	7	.42	Ogden Canyon, No. 1, Farr quarry.
27	9.47	4.22	8	.36	Ogden Canyon, No. 2, Farr Company's quarry.
			9		
			10		

Number	Cost. of Wear	Per Cent of Wear	Toughness	Per Cent of Absorption	WHERE FROM
28	8.11	4.36	5	.22	Ogden Canyon, No. 3 crushing plant.
29	7.69	5.20	8	.29	S. P. Camp, Willard, Utah.
30	3.22	12.43	7		
			9		
			4	4.5	R. J. Turner, Price, Utah.
			5		
31	8.18	4.45	11		Ogden Canyon, east of Farr quarry.
32	8.9	4.51	8		Farr quarry, Ogden Canyon.
33	8.0	5.03	10		Farr quarry, 50 feet west of 31.
34		Clay			Clay, J. H. Arthur, Cedar City, No. 1.
35		Clay			Clay, J. H. Arthur, Cedar City, No. 2.
36		Clay			Yellow lime clay.
37	8.94	4.49			No. 1, Springville, Utah.
38	10.58	3.78	18		No. 2, Springville, Utah.
39		Gravel			No. 3, Springville, Utah.
40	11.24	3.56	12		Ogden Canyon, Farr quarry, east of lime kilns, No. 1.
41	10.00	3.98	10		No. 2, Ogden Canyon.
42	9.72	4.12	9		No. 3, Ogden Canyon.
43	9.89	7.14	10		No. 4, Ogden Canyon.
44	10.75	3.75	18		No. 5, Ogden Canyon.
45	9.93	4.03	6		No. 6, Ogden Canyon, lime kiln
46	3.41	11.74			Conglomerate, Harry Joseph.
47	9.30	4.32	9		Lime stone, Harry Joseph.

If we use as a standard for the co-efficient of wear 10 and also 10 as a standard for the toughness then it will be noted on comparing the results in this table of co-efficients of wear and toughness, that we have tested several quarries that give results varying slightly below the 10 in wearing and strength and only a few quarries in which the co-efficient of wear is 10 and above. Most of the limestones tested range not far from eight, and only in the very hardest limestones do the co-efficients rise to 10.

Our tests No. 1 to 6 being taken from the stone near the Warm Springs Limestone Quarries give results which are below what we think a building stone for this road should give.

Sample No. 7 which is taken east of Kaysville is too soft a rock to be used.

Samples No. 9 to 11 were taken from the cement plant at Devil's Slide of the same rock that is used for the manufacture of cement. These limestone samples give wearing co-efficients which are too low and show that they are too soft for good road use.

Sample No. 12 is taken from a lime sandstone dyke which cuts through the lime and shale at the Devil's Slide plant. This stone shows a much higher co-efficient of wear on account of the silica contained in it, but the quantity of this material is limited.

Samples No. 13, 14 and 15 were taken from quarries between Devil's Slide and Morgan City. These quarries are of limestone and the results show that the rock in each case is too soft for good road purposes. The limestone ledges in Morgan County in Weber Canyon are geologically of a younger rock than the limestone found in Ogden Canyon.

Samples No. 16, 17 and 18 were taken from a point of rock in Emigration Canyon called Eagle Rock Point. This rock is a limestone shale. Our results here show this rock as being too soft.

Samples No. 19, 20 and 21 were taken from ledges and quarries near the mouth of Emigration Canyon. The wearing quality of these rocks are also below 10 and the number of impact blows for breaking are considerably too low.

Samples 22 to 25 are samples of slag which were taken from the ore slag dumps in Murray and Sandy. These slags show averages which are not far from what would be considered acceptable from the standpoint of wear and impact, but the use of this slag is out of the question as the quantity is not sufficient.

Sample No. 26 was taken from the Farr Limestone Quarry in Ogden Canyon by Levi Muir.

Sample No. 27 was taken about 100 yards east of the Farr Company's limestone quarry.

Sample No. 28 was taken from the crushing plant about one mile east of the Hermitage. It is observed that the rock from the Farr quarry shows wearing strengths and impact strengths of between 9 and 10.

Sample No. 29 is a sample of rock which was sent from the camp at Willard, Utah. This rock gives a co-efficient of wear of about 7.7 and impact below 10.

Sample No. 30 was sent from Price, Utah. This is a very soft rock.

Samples No. 31, 32 and 33 were rocks taken from the Farr Quarry in Ogden Canyon but were hardly representative samples on account of the samples being gathered when the ground was covered with snow.

The samples taken from Farr Quarry in Ogden Canyon show uniformly, in our opinion, better results for abrasion and impact than any of the other limestones we have tested. On this account the ledges east of the lime kilns were sampled more carefully and tested, the results being shown in tests No. 40 to 45. These samples being taken from the more silicious part of the ledges. They show good results in the wearing strength as also in the impact tests. Microscopic sections were made of this rock and they show fairly uniform distribution of silica or quartz in with the lime, which is the cause for its high hardness and toughness.

Sample No. 46 was a sample of conglomerate. This rock is altogether too soft. The wear here comes mainly from the calcareous cementing material.

Sample No. 47 is a silicious lime showing fairly good results.

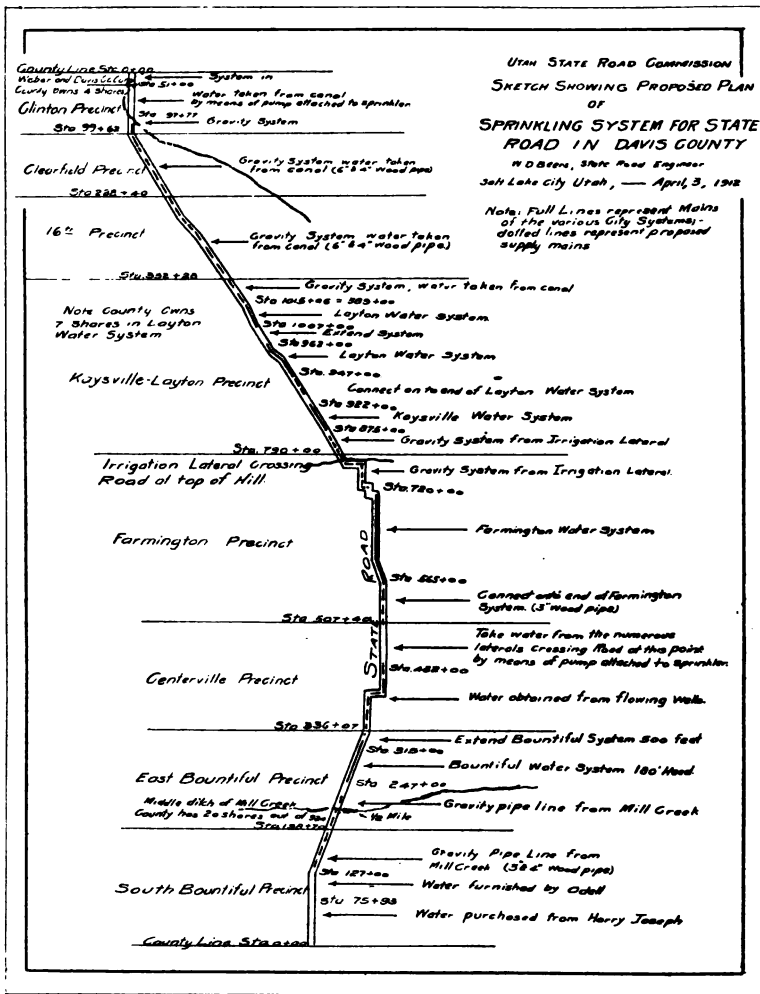
In our opinion of the limestones that we have tested there are none of the ledges which give as good results as the silicious limestone ledges immediately east of the Farr Quarry in Ogden Canyon, and we recommend first of all that this rock be the one chosen for use on the Davis County road."

Yours truly,

(Signed) E. H. BECKSTRAND,
W. D. BEERS.

SPRINKLING SYSTEM.

Up to the present time no sprinkling of roads has been carried on in Davis county, but in case an earth or water-bound macadam road is built, it will be necessary to install a sprinkling system along the highway. An estimate of the cost of such a system has been made in accordance with the print (as shown) on the supposition that



the water can be obtained as indicated on the print. The total cost of such a system is estimated at \$17,600.00. This does not include the purchase of water or sprinkling wagons.

As will be seen in the above print, the county has already purchased water rights as follows:

4 shares in the Weber-Davis canal.

7 shares in the Layton Water System—200-foot pressure head.

20 shares in the Middle Ditch of Mill Creek.

At other points along the road the county will have to make arrangements with irrigation companies, whose laterals cross the road, and with municipalities which have water systems. I am informed by the County Commissioners that, in a number of places, such arrangements have been made but no contracts signed.

In a portion of the Centerville district it is quite apparent that flowing wells will have to be driven to obtain water. This plan is feasible, as there are now a number of wells in this section.

For an estimate of the cost of installing the system in each precinct, see the lower part of table at end of this report.

COST OF MACADAMIZING ROAD.

In arriving at the estimated cost of constructing and macadamizing the State Road through the county we did so by precincts, so as to show the actual cost of constructing the road within each precinct and the amount of funds available for same.

As will be shown from the table of costs, the cost per mile or road within each precinct varies considerably. This is so especially in the Farmington and Kaysville-Layton precincts, and is due to the increased cost of grading and the length of wagon haul. The cost in these two precincts might be reduced considerably in case the commission owned a small portable crushing plant and installed it along the highway, crushing the local field stone, which are mostly quartzite boulders, and using this crushed material as a sub-base course.

In getting the detailed cost of the different classifications of work for this macadamizing, we first of all consulted our own records of cost on earth and macadam roads; also the records of the Utah Portland Cement Company and the Union Portland Cement Company, regarding the cost of quarrying and crushing rock.

EARTH EXCAVATION AND GRADING.

In making this estimate the yardage was taken from the profile and cross-sections obtained from the notes of the surveys made.

CULVERTS.

The cost of culverts are based on the quotations furnished, for the various sizes, by the Utah Culvert Company, with an additional allowance of \$10 for concrete ends and installation. In most cases concrete culverts will be used and can be built as cheaply as the estimate for corrugated iron culverts.

QUARRYING, CRUSHING AND SCREENING.

The cost of quarrying, crushing and screening is computed for a plant of 500 tons capacity and the unit cost is obtained by dividing one day's output by the actual labor and material cost per day.

FREIGHT.

Early in January the matter of the cost of hauling rock from Ogden Canyon to Davis County was taken up with the D. & R. G. R. R. Co., the Salt Lake & Ogden R. R. Co., the Ogden Rapid Transit R. R. Co., and the O. S. L. R. R. Co., with the following results:

Denver & Rio Grande Railway Company, no rate quoted.

Salt Lake & Ogden Railway Company, 20 cents per ton for first five miles, or any part thereof, and 3 cents for each additional mile.

Ogden Rapid Transit Company, 25 cents per ton for the first five miles and 3 cents for each additional mile.

Oregon Short Line Railway Company made the following schedule:

RATES FROM DEVIL'S SLIDE TO SALT LAKE.

Miles.	Devil's Slide to—	Rate.
6.9	Morgan	\$.25
14.3	Peterson .....	.25
21.9	Uintah .....	.25
31.3	Ogden .....	.30
40.1	Hot Springs .....	.40
45.3	Willard .....	.40
52.4	Brigham .....	.40
37.5	Roy .....	.45
40.9	Clearfield .....	.45
45.8	Layton .....	.45
47.9	Kaysville .....	.45
52.7	Farmington .....	.45
57.4	Centerville .....	.50
59.4	Wood's Cross .....	.50
67.7	Salt Lake .....	.55

RATES FROM OGDEN TO SALT LAKE.

Miles.	Ogden to—	Rate.
6.2	Roy	\$.25
9.6	Clearfield .....	.25
14.5	Layton .....	.25
16.6	Kaysville .....	.25
21.4	Farmington .....	.25
26.1	Centerville .....	.30
28.1	Wood's Cross .....	.30
36.4	Salt Lake .....	.35

For this estimate from Ogden Canyon to Ogden, five miles, we used the Ogden Rapid Transit rate, and from Ogden to points of destination in Davis County, the Oregon Short Line rates.

In estimating the freight haul no allowance was made for demurrage.

UNLOADING.

It was assumed that the unloading could be done from coal or side dump cars into bins, and then loaded into wagons.

WAGON HAUL.

The wagon haul was figured on a ton mile basis from the nearest Oregon Short Line switch for each precinct.

SPREADING, ROLLING AND BINDING.

The detailed estimated cost of these items was figured on the basis that the work would progress at such a rate that two road rollers could be used. The purchase price of water for binding was figured at the rate of 5 cents per 1,000 gallons.

FILLING.

The item of filler is carried as a separate item until the classification of rolling is reached; at this point this filler is considered as disappearing as it enters the voids of the rock and consequently does not enter into the unit cost thereafter. As there is considerable sand along the State Road in Davis County, only 50 per cent of the amount of filler was considered as coming from the crushing plant.

DEPRECIATION.

In determining the unit cost of all items in the classification the depreciation of all tools and equipment was figured in.

BITUMINOUS MACADAM.

In case bituminous macadam is used it would cost in the neighborhood of from \$1,700.00 to \$2,000.00 extra per mile, figures and cost being based upon the New York Highway Commission's method of figuring cost of bituminous macadam roads, but substituting our local prices in making the estimate.

CONVICT LABOR.

In case convict labor is used, we have made an estimate based on the percentage of convict labor that can be used on each class of work. This percentage was obtained by dividing each classification into its component parts and obtaining therefrom a percentage

of cost that can be done by convict labor. This cost also includes the use of State teams, due allowance being made for the subsistence and depreciation, but it does not include any rent on the same.

COST OF ROCK CRUSHING AND QUARRYING PLANT.

The following is an estimate of the cost of the rock crushing and quarrying plant, the former being based on a report submitted by Mr. Hansen of the Allis-Chalmers Company, and the latter on figures furnished by the Sullivan Drill Company.

Cost of site	\$ 1,500.00
Cost of steel bridge.....	3,000.00
Cost of bunk house, mess hall, etc.....	2,000.00
Cost of 1,000 feet of track at \$2.00.....	2,000.00
Cost of crushing plant.....	13,300.00

Quarry Plant.

Air compressor, 251 cu. ft. reg., 39 to 53 h. p.....	\$ 787.00	
Air receiver, 30x6 ft.!	60.00	
Two air drills (Sullivan), 2¼ piston, at \$136.....	272.00	
Two air drill tripods.....	71.00	
200 feet ¾ hose	160.00	
Cars, track and small tools.....	1,000.00	2,350.00
		<hr/>
		\$24,150.00

RECOMMENDATIONS.

After carefully reviewing the table showing the money available and cost of work, I would recommend the following:

First. That the site for the rock quarry in Ogden Canyon be purchased, as the County Commissioners of Weber County now have an option on same at \$1,500.00, which option will expire in a few days.

Second. That Mr. Eccles be visited by some member of the Commission to see if he could reduce his rate on the rock haul, as his rate is high, considering that he also asks that we put in a bridge across the Ogden River and about 1,000 feet of track. This item is shown in the cost of the rock plant.

Third. That the question of the three counties forming a partnership on the rock plant be taken up with Weber, Davis and Box Elder counties to see if they will take an equal interest in the plant and construct same, or allow us to use the State funds for their counties to construct same.

Fourth. That the road be graded throughout Davis County, as this is necessary if the macadam work is carried on later and will not materially increase the cost. Furthermore, the roads are now

in such shape that the center of the road is generally lower than the surrounding fields and should be graded.

Fifth. That a sprinkling system be installed in the north end of the county from the county line south to connect with the Layton water system.

Sixth. That macadam work be started in Davis County by the convicts as soon as rock can be delivered.

Seventh. That a carload of mules be purchased, with necessary wagons and harness, to increase team force to about 20 to 25 teams, and in that way they can do grading as well as macadam work and thereby reduce the cost of the work.

Eighth. That the County Commissioners of Davis County be urged to make another five-mill levy for 1912 on the precinct through which the State Road passes.

Yours respectfully,

(Signed)

W. D. BEERS,
State Road Engineer.

MILLARD COUNTY.

There are two pieces of road construction in Millard that have been made recently which deserve special mention. The road between Holden and Fillmore has been carefully laid out, the hills and hollows along the old road have been eliminated, thus greatly improving the grade, and a road has been built, which, with proper maintenance, will, no doubt, answer the needs of the County in this neighborhood for many years to come.

The second piece of earth construction in Millard County that deserves special mention is that across alkali flats and clay swamps called "Mud Lake." More or less money has been spent upon this road nearly every year for many years, with results that have not been very satisfactory. Stone is not available within a reasonable distance out of which to build a road in this neighborhood, and if it were available there is a question whether the traffic on this road is such as to warrant the expenditure of enough money to build a macadam road. After giving this problem careful consideration, the conclusion was reached that a well made sand-clay road, if properly maintained, would resist the traffic fairly well, and that the construction of such a road is not so expensive as to be regarded as extravagant for this County under the conditions there existing.

This road has been built by hauling alternate layers of sand and clay which have been plowed together, harrowed together, and scraped together in such a way that it is believed this sand-clay construction, after the moisture of winter has fallen upon it, and it has had a liberal use of the split-log drag, will resist the traffic in this neighborhood and produce a road of excellent quality nearly all of the time, and a road of fairly good quality the very worst seasons of the year.

SALT LAKE COUNTY.

The State Road work in Salt Lake County is so little in amount when compared with the road work the County does, and those in charge of this construction have had, and are having such a broad experience that only a very general supervision of the State Road work in this County is attempted. The assistance the State Road Commission has given in the design and construction of re-inforced concrete culverts, and re-inforced concrete bridges, which are being built in this County with such general satisfaction, is, perhaps, the only feature of the State Road Work work here that needs to be mentioned.

SANPETE COUNTY.

The work that has been done in Sanpete County is earth-road construction wherein the comparatively poor material available along the right-of-way for road construction has been used. The particular feature of road work in this County that deserves attention and commendation is the excellent way in which the roads have been maintained by the use of the split-log drag. It is generally conceded, I believe, by those familiar with road construction throughout the State that in the maintenance of earth roads, Sanpete easily takes the lead.

SEVIER COUNTY.

The State Road work in Sevier County has been so successful as to give general satisfaction to everybody concerned. Members of the State Road Commission are pleased

with it, as are also the County Commissioners and the people of Sevier County generally. The fact that in nearly every part of Sevier County there is available, close by, large quantities of excellent road material out of which to build earth roads, makes it comparatively easy to build, which with only a nominal maintenance cost, resist the demands of the traffic in that neighborhood in a very satisfactory way.

UTAH COUNTY.

Conditions in Utah county are much the same as in Salt Lake county. Those in charge of the road construction have so much county work to do that the work on the State road is done to the satisfaction of the State Road Commission without the expenditure of very much effort in the direction of supervision.

CROSS-SECTION OF ROADS IN SMALL CITIES AND TOWNS.

One of the problems to which a considerable amount of time and thought has been devoted, and for which no solution has been found that gives general satisfaction, is the establishment of a cross-section in accordance with which the roads in the smaller cities and towns of the State shall be built.

In general, city officials and others concerned in that matter have an idea that the road should be so crowned as to have a slope extending from the center of the right of way, in either direction, to the irrigating ditches near the tree lines on the sides of the street. When the fact is taken into account that nearly always these roads are lower near the center than are the ditches and the sidewalks, a moment's thought reveals the fact that there is but one way of building the cross-section above referred to, and that is to haul in material, not only to bring the road up to a level with the side ditches, but also to provide the crown the road must have if the moisture which falls upon it is to be carried into the side ditches in accordance with the intentions of

those who suggest, if they do not actually insist upon, this kind of construction.

Those who advocate this method of construction have an idea generally that if the center of the road is a few inches higher than the edge of the ditch, the slope thus provided will be satisfactory. All who have this idea should learn that actual experience has demonstrated that earth roads and gravel roads, in order to drain well, should have a slope from the crown to the gutter of about one inch to the foot.

Figure 1 shows the section desired by the authorities of Beaver City for city streets. The figures under it show the estimated cost of such a construction. These demonstrate that the cost positively prohibits the construction. A modern pavement could perhaps be built at a less expense.

Figure 2 shows the section the writer proposed for use in the streets of Beaver City, and the estimated cost of such a construction.

These two cross-sections are submitted since conditions at Beaver are practically the same as those existing elsewhere, and almost everywhere throughout the State.

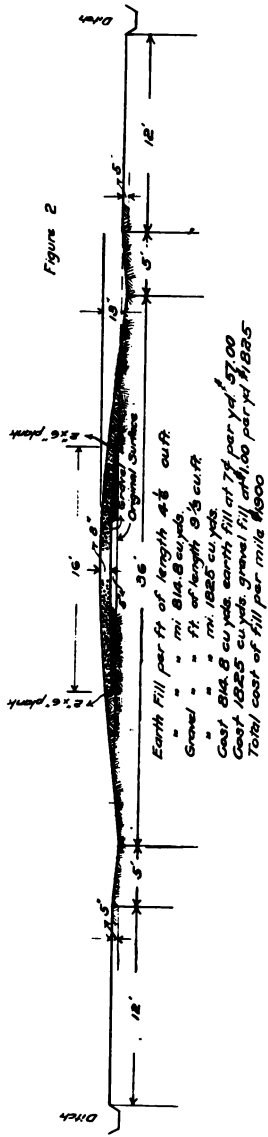
The statement made above should be emphasized that no generally satisfactory cross-section for such construction has been found.

THE FIVE-MILL TAX.

In every case where the members of the State Road Commission have carried the question of the five-mill tax for State Road work to the people themselves, these people have proved to be enthusiastically in favor of the tax. The proposition put briefly is this: The laborer pays a tax amounting to fifty cents, he gets one dollar and fifty cents for working on the road at a time when he would otherwise be idle, and secures for his own use a road worth one dollar and fifty cents. It is hoped the Legislature will enact a law that will require the County Commissioners to place this tax on the property in these precincts in which State Road work is done. Such a law will aid greatly in advancing the work of improving the roads.

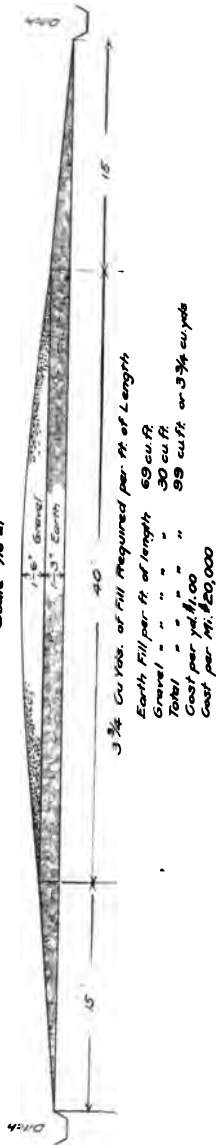
SECTION RECOMMENDED BY RICHARD R. LYMAN, STATE ROAD COMMISSIONER
FOR CITY STREETS WHERE GRAVEL IS USED
1912

Scale 3/16"=1'



SECTION DESIRED BY AUTHORITIES OF BEAVER CITY
FOR CITY STREETS
1912

Scale 3/16"=1'



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TILDEN FOUNDATIONS.

State Road Commission,
Salt Lake City, Utah.

Gentlemen: The tables prepared by the State Road Commission give figures and facts concerning the road work done in the various counties over which I have had supervision better than I could explain, for that reason, I will simply make a general statement pertaining to some conditions that should be remedied, as provided for in your proposed amendments to the present road laws of the State of Utah.

Very truly yours,
(Signed) DAVID MATTSON.

CARBON COUNTY.

As is shown by the tabulated report, the State Road work in Carbon County within the past two years has been confined to two stretches of road, one extending from Castle Gate through Helper, Spring Glen, and Price to Wellington, and the other, from Price to the Emery County line. Of the former, all but two small stretches of road are now completed. One of these stretches about one and one-fourth miles in length, lies half way between Spring Glen and Price, and the other stretch, about two and one-half miles in length, is in the Helper precinct. Of the latter road, the entire stretch between Price and the Emery County line is completed.

The road from Castle Gate to Wellington is an earth road for its entire length. In a number of places along the road, dugway construction was required, and in all such cases, the lower side of the road had to be built up with a rock wall so as to keep the surface of the road from sloughing down hill. This made a rather expensive construction. The road from Price to the Emery County line is also an earth road and passes through a country that is frequently subjected to cloud bursts, and as a result the surface of the ground is cut with numerous washes which have to be bridged with good substantial structures to keep them from

being washed out during the floods. With one exception, all these bridges are under 20-foot span, and \$8100.00 has been spent in the past two years in bridging them.

Out of a total of twenty-one miles of improved road within the county, all but three and one-fourth miles have been built in the past two years, in addition eleven bridges and sixty-five culverts were constructed, at a total expenditure of \$25,900.00. The money for this work was derived from State appropriation, county appropriation, from the General Fund provided by law and the revenue from the five mill tax. There is still to be done much needed work in Carbon County, especially, in the Price River Canyon between Castle Gate and the north boundary line of Carbon County, but the State Road Commission is powerless to proceed with the said road work in this county for the reason that the County Commissioners of the county refused to levy the five mill tax in 1912, leaving Carbon County without funds for State road work during the year 1913. This shows plainly that the law should be compulsory in the matter of levying the five mill tax in precincts through which the State Road runs.

EMERY COUNTY.

The State Road work in Emery County, up to the present time, has been confined entirely to the stretch of road lying between the north boundary of the county and the City of Emery. This road is about forty-five miles in length, and is now completed with the exception of a stretch of about one mile in length which lies north of Huntington, and this is being rapidly pushed to completion. The above mentioned road passes through alternate stretches of sand, clay and gravel all of which has been turn-piked into an excellent earth road. The country here, as in Carbon County, is cut by numerous washes which had to be bridged, thereby adding considerably to the cost of the road per mile. Of the forty-four miles of road now completed, all but sixteen miles have been done in the past two years; in connection with this road twelve bridges and

sixty-one corrugated iron culverts have been built. This construction has involved an expenditure of about \$24,000.00, and as a result has given Emery County a splendid road from its various towns to the railroad.

The road from Green River to Castle Dale has been designated as a State Road within the past two years and a three mill tax levied upon the precincts through which the said road runs. However, it was agreed with the County Commissioners at the time the road was designated, that they would levy a five mill tax, and if the tax had been levied, the State Road Commission would have been in a much better position to build a good road between Green River and Castle Dale.

GRAND COUNTY.

The State Road in Grand County runs from the town of Elgin on the Green River, paralleling the Denver and Rio Grande Railroad to Little Grande, where it leaves the railroad and runs in a southeasterly direction to Valley City; here the road branches, one branch running to Thompsons and thence following the Denver & Rio Grande to the Colorado State Line, the other branch runs through Moab, thence to Monticello in San Juan County. On the road from Thompsons to the San Juan County line, all the State Road improvement during the last two years has been done. The road from Thompsons to Moab is thirty-six and one-half miles long and seventeen and one-fourth miles of this road have been improved. From Moab to the County line on the south is eight and one-fourth miles and four and one-eighth miles of this road have been improved. This improvement work has, however, not been confined to one continuous stretch of road, but has been done in places where the improvement was most needed. In all, twenty miles of State road have been turnpiked, twelve and one-half miles of this being dugway construction. The nature of the soil through which the road passes is mainly earth and clay.

The State Road work as completed in Grand County, together with the building of the \$45,000.00 bridge across the

Grand River at Moab, gives the people of this county a fairly good road to the railroad.

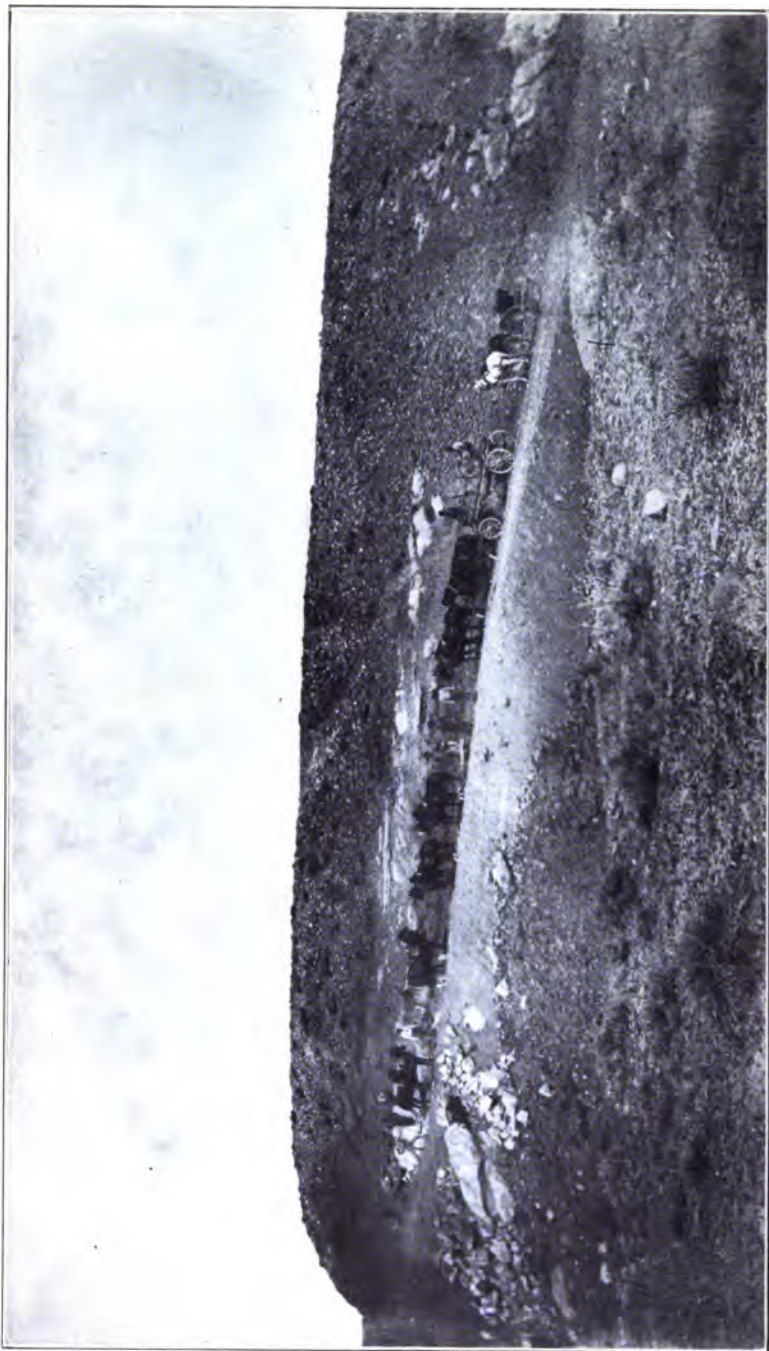
You will observe that State Road improvements in Emery and Grand Counties have been made from the Denver & Rio Grande Railroad to the towns in the said counties and every effort has been put forth for the convenience of the inhabitants of said counties rather than improving the road parallel to the Denver & Rio Grande Railroad for an interstate highway. The improvement of this latter road can now be taken up.

SAN JUAN COUNTY.

State road construction in San Juan County has been a rather difficult task on account of the nature of the country through which the State Road passes. Between Monticello and Moab, in Grand County, there is a stretch of thirty-five miles of the worst kind of desert sand, and to construct a road through this kind of material is almost impossible. Consequently very little road improvement has been done between Monticello and the Grand County line. However, there has been spent, approximately, \$1,200.00 in making surveys of a proposed road between Moab and Monticello via La Salle. Although this proposed road will be difficult to construct, it is the only feasible outlet for San Juan County over suitable material for road construction. If this road could be built according to the surveys made it would be the means of avoiding the above-mentioned stretch of desert sand, which is a very important thing to do as San Juan County has approximately 1,000,000 acres of the very best kind of dry farm land, the products of which could not be marketed unless a better road location is secured than the present route over the desert sand.

Most of the State Road improvement for the past two years has been made along the road between Monticello and Goodridge. This work has consisted mainly of rock work across canyons improving the heavy grades occurring there and in draining and ditching the road where most needed. In all, about \$14,000.00 has been spent in making these improvements.

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State Road Dugway Construction in Uintah County.

UINTAH COUNTY.

Uintah County has, at the present time, about sixty-four miles of State Road which begins at the Utah-Colorado State line and runs thence via Jensen, Vernal and Moffatt to the Wasatch County line near Roosevelt; of this road thirty-two miles have been improved. Of the improvement, all but six miles have been done in the past two years, entailing a total expenditure of \$16,800.00. The road improvement has not been concentrated along any particular stretch of road but was done throughout the entire county wherever it was deemed most necessary. The kind of construction consists mainly of earth turnpike, with occasional dugway construction, and such bridges and culverts as were required to take care of the drainage across the road. This, together with the \$35,000.00 bridge at Jensen, makes a fairly good road from the Colorado State line through Uintah County and the people in general are well pleased with the improvements made.

Uintah County has only levied a two and one-half mill tax in place of a five-mill. This has not only held the State Road work back in said county, but is unfair to the counties of the State which levy the five-mill tax and receive only the same amount of State appropriations as does a county like Uintah, giving another strong reason why the five-mill tax should not be optional with the County Commissioners.

WASATCH COUNTY.

Out of the 173 miles of State Road in Wasatch County, forty-four miles have been improved, of this improvement all but two and one-half miles were done within the past two years. There was also constructed within this same period of time sixteen wooden bridges and one steel bridge, all of which entailed an expenditure of \$13,000.00. The major portion of this work has been done on the State Road beginning at the Uintah-Wasatch County line near Roosevelt and running through Myton, Theodore and Indian Canyon to the Carbon County line on the road to Colton, the balance of the improvement having been done in Daniel's Canyon

Between Thurber and Torry the road passes over a stretch of heavy sand, and suitable surfacing material may be had only by hauling a considerable distance. The surfacing material was in the nature of a broken down lime shale, which broke up in rather large fragments, but which with use and weathering broke up to finer texture and formed a good wearing surface.

The total miles of road constructed, the location of the various parts and a list of the road structures built are shown in the tabular form at the end of this report.

PIUTE COUNTY.

In 1910, 4.9 miles of excellent road were constructed between the upper crossing on Ten Mile Creek and Junction. This part of the road has been extended south through the town of Junction to where the old County Road turns east to round the hill which separates Circle Valley from Junction, a distance of approximately 3 miles, and north as far as Cottonwood Creek, a distance of approximately $3\frac{1}{2}$ miles. The north portion of this stretch of road passes over very gently rolling hills with a slope of about 3% across the line of the road. A portion of the country over which it extends is very rocky, consisting of a mass of quartzite boulders and cobbles washed down from Cottonwood Canyon. Since these had to be removed from the road bed, the remaining material resulted in a comparatively low grade of good quality. On account of the splendid natural drainage and the difficulty with which good road stuff was obtainable along the right of way, it was deemed inadvisable and unnecessary to build a line grade. The road bed as formed is very hard and compact and, notwithstanding its shallowness, has supported the traffic very well. The south extensions of this stretch of road passes over a comparatively level country, and while portions of it contained a considerable proportion of rocks, enough good material was easily obtainable with which to build a grade of moderate height. The road through the town of Junction for a distance a little less than one mile was graded from ditch to



On State Road, Wayne County.

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ditch. The street had been worn hollow, through the town, and in order to get a proper crowning, the borrow trenches had to be cut down considerably below the sidewalk elevation. The only way to avoid this would have been to haul in material from the west edge of town, a distance of about one-third of a mile. It was estimated that to raise the street six inches through the town, by this means, would involve an additional expense of about \$1,200.00. A committee of citizens of the town were appointed to make a canvass with a view to raising this amount, it having been suggested by the State agents that if the citizens would furnish the transportation from the borrow pits to the road, the regular road crew could provide for the loading of the dump wagons and the disposition of the material after its arrival. The committee met with considerable response, but not sufficient to raise the street as much as desired. The road was therefore built as above stated.

Another stretch of road was built from the Garfield County line on the south and following the county road north and east to the north end of Circleville, a distance of $3\frac{1}{2}$ miles. The upper portion of this road lay between two irrigation ditches, one of which was built just along the foot of a very steep and almost solid rock hill, and the other along the edge of the field below. The space between the two ditches was very narrow in places, was strewn with large rock fragments, and the road bed had been worn until it had become practically a permanent mud hole, and since it had to follow the canal alignments very closely, it was very crooked. It looked like a difficult and expensive piece of work unless the property owners could be prevailed upon to abandon the lower canal and contribute sufficient of their land to widen the right of way to a standard width. When they were approached on the matter, they very generously told the State Agent to designate a straight roadway and they would themselves remove any fences in the way, and after the road was built, place their fences back on the border of the right of way designated, also, that if the State would put in two small culverts under the roadway

for laterals from the upper canal, they would abandon the lower canal and thus further simplify the road construction. Their offer was readily accepted and a very bad piece of road made good at the average cost.

The citizens of Circleville, in order to have one mile of the road through their town graded from ditch to ditch, contributed \$200.00 in labor. These matters are mentioned to indicate that a more genuine road sentiment is being developed in the rural districts.

The road leading immediately out of Marysvale southward extends along the side of a very steep gravelly hill to the top of the Marysvale bench. This dugway, as built, was very narrow and of uneven grade. It had always been in a dangerous condition and one or two lives had been lost due to accidents in passing over it. At the solicitation of the people of the county and of people in general who had to travel this road, the State Agent was instructed to move his crew down to this point, and widen and straighten this dugway so that a third stretch of road was built in the county, extending from Bullion Creek bridge in Marysvale and south to the corner of the field, a distance of about one-half mile.

Thirteen reinforced concrete culverts were built. The sizes and detailed costs of which were as follows:

Culvert No. 1.

18" Tubular, 20' long, end and wing walls, built in June, 1912.
Contains 3.6 cubic yards concrete.

Material—

18 sacks cement at 71¼c.....	\$12.82
136 pounds reinforcing steel at 3½c.....	4.76
*Lumber, wire and nails.....	3.00

Labor—

Excavation	4.87½
Concreting (including forms)	12.93½
†Hauling material	13.50

\$51.89

Cost per cubic yard concrete, \$14.41.

*Lumber, wire and nails used for building forms; cost is distributed in proportion to cubic yards concrete.

†Hauling material includes hauling of sand and gravel, water, cement, and reinforcing steel, is pro rata according to yardage by sections of road length, which determines distance of haul.

Culvert No. 2.

18" Tubular, 20' long, end and wing walls, built in June, 1912.
Contains 4.0 cubic yards concrete.

Material—

20 sacks cement at 71¼c.....	\$14.25
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.20

Labor—

Excavation	4.61
Concreting (including forms)	12.60
Hauling material	13.50

\$52.92

Cost per cubic yard concrete, \$13.23.

Culvert No. 3.

18" Tubular, 20' long, end and wing walls, built in June, 1912.
Contains 3.6 yards concrete.

Material—

18 sacks cement at 71¼c.....	\$12.82
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.00

Labor—

Excavation	3.25
Concreting (including forms).....	12.61
Hauling material	13.50

\$49.94

Cost per cubic yard concrete, \$13.87.

Culvert No. 4.

18" Tubular, 20' long, end and wing walls, built in July, 1912.
Contains 3.6 cubic yards concrete.

Material—

18 sacks cement at 71¼c.....	\$12.82
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.00

Labor—

Excavation (including forms)	13.84
Hauling material	14.40

\$54.02

Cost per cubic yard concrete, \$15.00.

Culvert No. 5.

24" Tubular, 20' long, end and wing walls, built in July, 1912.
Contains 5.2 cubic yards concrete.

Material—

26 sacks cement at 71¼c.....	\$18.52
166 pounds reinforcing steel at 3½c.....	5.81
Lumber, wire and nails.....	4.35

Labor—

Excavation	5.53
Concreting (including forms)	25.35
Hauling material	20.80

\$80.36

Cost per cubic yard concrete, \$15.45.

Culvert No. 6.

4'x4' Box, 20' long, end and wing walls, built in July 1912.
Contains 13 cubic yards concrete.

Material—

66 sacks cement at 71¼c	\$47.02
515 pounds reinforcing steel at 3½c.....	18.03
Lumber, nails, and wire.....	11.00

Labor—

‡Excavation	19.50
Concreting (including forms).....	70.54
Hauling material	50.20

\$216.29

Cost per cubic yard concrete, \$16.63.

Culvert No. 7.

18" Tubular, 20' long, end and wing walls, built in July, 1912.
Contains 3.7 cubic yards concrete.

Material—

19 sacks cement at 71¼c.....	\$13.54
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.00

Labor—

Excavation	6.50
Concreting (including forms).....	14.63
Hauling material	14.80

\$57.23

Cost per cubic yard concrete, \$15.47.

‡ This culvert is for the crossing on Ten Mile Creek. During its construction, two floods occurred in the creek, which delayed the work and did considerable damage to the part of the structure already in place, which had to be partly rebuilt.

Culvert No. 8.

24" Tubular, 20' long, end and wing walls, built in July, 1912.
Contains 6.0 cubic yards concrete.

Material—	
31 sacks cement at 71¼c.....	\$22.09
166 pounds reinforcing steel at 3½c.....	5.81
Lumber, wire and nails.....	4.35
Labor—	
Excavation	2.60
Concreting (including forms)	19.50
Hauling material	24.00
	<hr/>
	\$78.35
Cost per cubic yard concrete, \$13.06.	

Culvert No. 9.

18" Tubular, 20' long, end and wing walls, built in July, 1912.
Contains 3.6 cubic yards concrete.

Material—	
18 sacks cement at 71¼c.....	\$12.82
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.00
Labor—	
Excavation	11.70
Concreting (including forms)	13.33
Hauling material	14.40
	<hr/>
	\$60.01
Cost per cubic yard concrete, \$16.67.	

Culvert No. 10.

18" Tubular, 20' long, end and wing walls, built in July, 1912.
Contains 3.6 cubic yards concrete.

Material—	
18 sacks cement at 71¼c.....	\$12.82
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.00
Labor—	
Excavation	7.80
Concreting (including forms)	14.30
Hauling material	14.40
	<hr/>
	\$57.08
Cost per cubic yard concrete, \$15.85.	

Culvert No. 11.

18" Tubular, 20' long, end and wing walls, built in July, 1912.
Contains 3.0 cubic yards concrete.

Material—

15 sacks cement at 71¼c.....	\$10.69
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.00

Labor—

Excavation	3.12
Concreting (including forms).....	16.00
Hauling material	10.50

\$48.97

Cost per cubic yard concrete, \$16.02.

Culvert No. 12.

1'x2' Box, 20' long, end and wing walls, built September, 1912.
Contains 3.2 cubic yards concrete.

Material—

16 sacks cement at 71¼c.....	\$11.40
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.00

Labor—

Excavation	6.25
Concreting (including forms)	13.89
Hauling material	10.50

\$49.71

Cost per cubic yard concrete, \$15.53.

Culvert No. 13.

18" Tubular, 20' long, end and wing walls, built September, 1912.
Contains 3.0 cubic yards concrete.

Material—

15 sacks cement at 71¼c.....	\$10.69
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.00

Labor—

Excavation	6.50
Concreting (including forms)	15.87
Hauling material	10.50

\$51.32

Cost per cubic yard concrete, \$17.11.

Summary.

Total number of culverts.....	13
Total cost	\$897.24
Total cost exclusive of excavation.....	809.76
Average total cost per cubic yard.....	15.18
Average total cost per cubic yard exclusive of excavation.....	13.70

There remains to be built to complete the north and south road through Piute County, a gap of approximately four miles between Junction and Circleville, another gap of approximately $3\frac{1}{2}$ miles between Cottonwood Creek and Marysvale and an extension from Marysvale south to the Sevier County line.

To complete the gap between Junction and Circleville, it is proposed to depart from the present County Road. The County Road extends over a very bad alkali flat which would necessitate the hauling of a great quantity of road material a long distance and involve enormous expense to make a good road bed. It is therefore proposed to extend the road directly south from Junction thence through a low pass to the south hill slope bounding the north side of Circle Valley, follow around the edge of this hill to a point opposite the north end of the road built through Circleville and then connect up with a direct north and south road. By following this route, the distance between the two towns will be considerably lessened. The road will all lie on one side of the river, thus avoiding the construction of one river bridge (on the County Road, the river is crossed twice—one bridge is a good, serviceable structure; the other would have to be replaced by a new one) and good road stuff is to be found over the entire distance, with the exception of about three-fourths of a mile at the extreme south end. Material for this will have to be hauled from the adjacent hill. The gap between Cottonwood Creek and the end of the road extending south from Marysvale will follow the county road, and aside from several culverts required, will offer only the ordinary construction problems. The extension north from Marysvale to the Sevier County line will enter the Sevier Canyon at a point approximately one and a half miles below Marysvale. Down to this point it will present only the ordinary problems of road construction. The balance of the distance, about three and one-half miles will be largely heavy side-hill work, with a number of solid rock cuts for short distances. It will lie wholly on the west side of the river. Piute County is

anxious and ready to have its north and south road completed, and at the present outlook should readily complete the road from the Sevier County line on the north to the Garfield County line on the south.

GARFIELD COUNTY.

In 1910, a stretch of road was laid out in the lower end of Panguitch Valley and only a small part—about one and three-fourths miles—put in condition for travel. A portion of this extended across a sandy flat and had to be surfaced with a clayey gravel found in the immediate vicinity. This surfacing proved to be insufficient, and with the heavy traffic during the spring of 1911, it was very badly rutted and cut up. It, therefore, became necessary in the fall of 1911, to repair and resurface this portion of the road. A stretch of about three-fourths of a mile of road immediately north of Veater's ranch had been worked out roughly. This also had to be reworked. The road was then extended north and south at either end so as to extend from the top of the hill immediately north of Orton to the head of Circleville Canyon, a total distance of 5.65 miles. About two-thirds of this distance is sidehill work and in general contained good road material in place, and required only cutting down, separating and properly compacting to produce a good road bed. The method employed was to loosen the material with a road plow and roter, pull it out onto the road bed with ordinary tongue scrapers; then harrow thoroughly with a special road harrow. This process brought all large rocks to the surface, leaving the finer material well mixed and distributed. The rough material was thrown off the road bed with forks, and when necessary, laid along the slope of the road grade in such a manner as to hold the finer material in place on the grade. This stretch of road crosses a number of gullies and cross-drainage channels. These were all provided with concrete culverts, fifteen in all, four of which were built in 1910, with some additions, as noted below, in 1912. Eleven culverts were built in 1912, the sizes and detail costs of which were as follows.

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**State Road Through Circleville Canyon, Garfield County,
Showing Sidehill Construction.**



**State Road Ready for Surfacing, Near Veater's Ranch,
Garfield County.**



**State Road Surfaced, at Veater's Ranch
Garfield County.**

CULVERTS IN GARFIELD COUNTY.**Culvert No. 1.**

18" Tubular, 20' long, end and wing walls, built in May, 1912.
Contains 4.6 cubic yards concrete.

Material—

23 sacks cement at 71¼c.....	\$16.39
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, nails and wire.....	4.14

Labor—

Excavation	1.95
Concreting (including forms)	19.50

\$46.74

Cost per cubic yard exclusive of hauling material, \$10.16.

Culvert No. 2.

18" Tubular, 20' long, end and wing walls, built in May, 1912.
Contains 5.0 cubic yards concrete.

Material—

26 sacks cement at 71¼c	\$19.53
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	4.50

Labor—

Excavation	3.90
Concreting (including forms)	31.20

\$63.89

Cost per cubic yard, exclusive of hauling material, \$12.77.

Culvert No. 3.

4'x5' Box, end and wing walls, 20' long, built in May, 1912.
Contains 13.1 cubic yards concrete.

Material—

64 sacks cement at 71¼c.....	\$45.44
540 pounds reinforcing steel at 3½c.....	18.90
Lumber, nails and wire.....	11.79

Labor—

Excavation	5.20
Concreting (including forms).....	43.32

\$124.65

Cost per cubic yard, exclusive of hauling material, \$9.51.

Culvert No. 4.

3'x4' Box, 20' long, end and wing walls, built in May, 1912.
Contains 8.0 cubic yards concrete.

Material—

39 sacks cement at 71¼c	\$27.79
386 pounds reinforcing steel at 3½c.....	13.51
Lumber, nails and wire.....	7.20

Labor—

Excavation	5.85
Concreting (including forms).....	38.68

\$93.03

Cost per cubic yard, exclusive of hauling material, \$11.63.

Culvert No. 5.

18" Tubular, 20' long, end and wing walls, built in May, 1912.
Contains 4.4 cubic yards concrete.

Material—

23 sacks cement at 71¼c.....	\$16.39
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails.....	3.96

Labor—

Excavation	1.95
Concreting (including forms).....	26.00

\$53.06

Cost per cubic yard, exclusive of hauling material, \$12.05.

Culvert No. 6.

24" Tubular, 20' long, end and wing walls, built in June, 1912.
Contains 5.6 cubic yards concrete.

Material—

28 sacks cement at 71¼c	\$19.95
163 pounds reinforcing steel at 3½.....	5.65
Lumber, wire and nails.....	5.04

Labor—

Excavation	4.55
Concreting (including forms)	36.40

\$71.59

Cost per cubic yard, exclusive of hauling material, \$12.78.

Culvert No. 7.

18" Tubular, 20' long, end and wing walls, built in May, 1912.
Contains 4.2 cubic yards concrete.

Material—

21 sacks cement at 71¼c.....	\$14.95
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, nails and wire.....	3.78

Labor—

Excavation	3.25
Concreting (including forms)	22.75

\$49.49

Cost per cubic yard, exclusive of hauling material, \$11.78.

Culvert No. 8.

18" Tubular, 20' long, end and wing walls, built in June, 1912.
Contains 3.6 cubic yards concrete.

Material—

18 sacks cement at 71¼c	\$12.82
136 pounds reinforcing steel at 3½c.....	4.76
Lumber, wire and nails	3.24

Labor—

Excavation	1.30
Concreting (including forms)	14.95

\$37.07

Cost per cubic yard, exclusive of hauling material, \$10.30.

Culvert No. 9.

3'x3' Box, 20' long, end and wing walls, built in June, 1912.
Contains 6.6 cubic yards concrete.

Material—

33 sacks cement at 71¼c.....	\$23.51
275 pounds reinforcing steel at 3½c.....	9.63
Lumber, nails and wire.....	5.94

Labor—

Excavation	4.55
Concreting (including forms)	32.83

\$76.46

Cost per cubic yard, exclusive of hauling material, "

Culvert No. 10.

3'x3' Box, 20' long, end and wing walls, built in June, 1912.
Contains 7.0 cubic yards concrete.

Material—

35 sacks cement at 71¼c	\$24.93
275 pounds reinforcing steel.....	9.63
Lumber, nails and wire.....	6.30

Labor—

Excavation	6.50
Concreting (including forms)	37.37

\$84.73

Cost per cubic yard, exclusive of hauling material, \$12.10.

Culvert No. 11.

24" Tubular, 20' long, end and wing walls, built in June, 1912.
Contains 6 cubic yards concrete.

Material—

29 sacks cement at 71¼c.....	\$20.66
163 pounds reinforcing steel	5.65
Lumber, nails and wire.....	5.40

Labor—

Excavation	9.75
Concreting (including forms)	37.37

\$78.83

Cost per cubic yard, exclusive of hauling material, \$13.27.

Building end and wing walls onto three culverts which were built in 1910 without these parts:

Material—

32 sacks cement at 71¼c.....	\$22.80
275 pounds reinforcing steel at 3½c.....	9.63
Lumber, wire and nails.....	5.70

Labor—

Total of concrete crew.....	61.75
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\$99.88

Stone Culvert on Pine Creek. *

6'x7'x24', built October, 1912.

Contains 85.3 cubic yards stone; 4.6 cubic yards concrete.

Material—

145 sacks cement at 71¼c.....	\$103.33
115 pounds reinforcing steel at 3½c.....	4.02
Lumber, nails and wire.....	24.38

Labor—

Excavation	18.75
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\$150.48

Cost per cubic yard, exclusive of hauling material, \$16.74.

Bridge on Dry Canyon Wash.

20' span, stone abutments 12' high.

Contains 62 cubic yards stone masonry.

Material—

Lumber for stringers and cover, 2740 board ft. at \$25.00..	\$ 68.40
182 sacks cement at 71¼c.....	129.68
Lumber, wire and nails for forms.....	24.38

Labor—

Excavation	17.40
Building abutments (including placing and removing forms)	87.22
Building deck	8.50

\$335.58

Cost per cubic yard, exclusive of hauling material, \$5.41.

*Building culvert including placing and removing forms.

The culverts are numbered consecutively from 1 to 11, beginning at the north end of the road at the head of Circleville Canyon.

The road work was then transferred to the extreme northern boundary of the county. From this point, the road enters Circleville Canyon and follows up the Sevier River, a distance approximately twelve miles. The old county road, which lay along the bottom of the canyon, was subject to overflow in many places during high water. It contained many abrupt grades, and for the most part, was very sandy where it lay along the river bottom, and extremely rough and rocky where it passed over ridges which extended out too near the river for the road to pass between the face of the ridge and the river edge. The river was twice crossed by means of very primitive and inadequate wooden structures. The road through this canyon is the only outlet for Garfield and Kane counties to the terminus of the D. & R. G. Railroad at Marysvale, and is subject to a heavy and continuous traffic. The best road that can be built with the material available is warranted and demanded.

After careful consideration of the conditions and requirements, it was decided to abandon the bottom of the canyon and build the road along the west sidehill the entire distance, doing away with the bridges over the river entirely, and evening up the grade as much as possible. This sidehill is very steep, with an occasional comparatively flat bench at moderate elevations, about 40 to 60 feet, above the bottom of the canyon. The material on the sidehill is very rough, a portion of which is cemented and other portions consist of solid rock. The flatter benches, especially in the lower portions of the canyon, consist of masses of huge boulders. The finer material and the cemented material, after being broken up, make a good surfacing material. Under these conditions, the road location was made to swing immediately onto the side hill at the point where it crosses the county line and laid out with as nearly uniform grade up the canyon as circumstances would permit. With the large amount of rock and the comparatively small amount of suitable surfacing material special care was required so as

not to waste the latter. As the work of cutting down the sidehill proceeded, the rocks taken out were, in general, carried forward for the bottom of fills or used as a dry wall along the edge of the grade to hold the road material from sloughing down the hill. The finer material was worked back and left in heaps along the roadway to be spread on the surface when the sub-grade was completed. It was a more than ordinarily difficult piece of work, but the plan adopted appears to be justified by the result thus far. About 3½ miles of road has been completed in very excellent condition, and is the pride and delight of the people who travel it. Much credit is due Mr. Jos. McCullough, who has had immediate charge of this work, not only for the splendid piece of road, but also for its very conservative cost.

Two special road crossings were built on this stretch of road, one over Pine Creek and the other over Dry Canyon Wash. Both of these side canyons drain a portion of country which is subject to very heavy and sudden floods, and demand extra massive construction to withstand the heavy torrents to which they will be subject.

It is proposed to continue the work on the road up the canyon to connect with the road at the head. With this in view, the road camp has been moved up to the bridges, and while the ground is frozen so as to render it impracticable to work on the regular road construction, a heavy piece of rock work between the bridges is being shot so that the road may be opened west of the river before the spring traffic begins.

Work In Hillsdale Precinct.

In addition to the above described work, a stretch of road was built immediately above the Sevier River bridge, between Hillsdale and Hatch. This stretch of road runs along the foot of a steep lava ledge and was at certain times of the year practically impassable on account of mud, and large rocks. Mr. Spencer of Kane County, was there working in that vicinity had general supervision of this piece of work. An expenditure of \$692.48 was made

KANE COUNTY.

The first State Road in Kane County was designated by way of Alton, Johnson Canyon, and Kanab. This road left the valley of the Virgin River at Gravel Springs, some eight miles above Long Valley, where the settlements of Glendale, Orderville and Mt. Carmel are situated. These towns by this designation were left off from direct participation in State Road work.

The county being poor, its revenues small, the Commission proposed that the appropriation from the county for State Road work be diverted from the State Road fund and used in improving the Long Valley road below Gravel Springs. While this action was appreciated by the Long Valley people the agitation which was begun against the Johnson Canyon location at the time it was made, was vigorously maintained, the object being to change the State Road location from Johnston Canyon to Long Valley. Such a change would have necessitated crossing a mesa, covered with loose sand, lying between Mt. Carmel and Kanab. This stretch of road, except in wet weather or when the ground is frozen is impossible to loaded teams, the fact being that only with the greatest difficulty and by slowest progress can this road be used even by light traffic during the greater part of the year.

The route over the sand is, however, used for the mail, since it furnishes the shortest mileage to reach the several settlements in Kane County. The use of this road for the mail was urged early and late in its favor. Repeated examinations revealed no practicable means of fixing the stretch of mesa sand so that in Kane County the sentiment in the matter of State Roads continued to be vigorously divided until the summer of 1912, when the State Road Commission by a trans-mountain designation connecting Kane and Iron Counties was able to place the Long Valley Settlements on a State Road. Since this additional designation the difference between the communities at Kanab and Long Valley have been healed and the criticism of the State Road Commission practically ceased, so that now, in local

support and local assistance, the State Road work in Kane County stands in the most favorable situation possible.

In 1912 the County Commissioners placed the five mill tax on all the precincts in the County through which State Roads now run without the necessity of any special urging on the part of the State Road Commission. While the State Road did not run through all the precincts of Kane County in 1911, the five mill tax was placed upon the property of each precinct where State Road at that time had been designated.

During the present biennium, the State Road has been graded and most of the metal culverts placed, from the north boundary of the county to the top of the hill on the road to Alton; also a stretch of earth road 0.2 of a mile long has been built between Spencers and Glendale, in the Glendale precinct where the floods had practically carried away the old road, and in addition a bridge of 30-ft. span crossing the north fork of the East Fork of the Virgin River has been built.

WASHINGTON COUNTY.

In the fall of 1911, after it was settled to take the convicts to Washington County for the winter, a committee from the State Road Commission went to St. George, and in a meeting with the County Commissioners, reached an agreement that where work was done in precincts upon which the five mill tax had not been levied, that the levy would be made the following year, even though State Road funds should not be spent in those precincts the year the tax was levied.

In pursuance of that agreement, a convict camp was established near the town of Middleton, and some sixteen convicts employed, building a stretch of road approximately six miles in length through the St. George and Washington precincts. Following the terms of the agreement, the five mill tax was placed on the St. George and Washington precincts in August, 1912, the revenues from which

be used in further construction in those precincts in the spring of 1913.

In June, 1912, a series of meetings were held by a committee of the State Road Commission with the citizens of Hurricane, La Verkin, and Toquerville, looking to the organization of a special road district to cover the property in these three settlements, for the purpose of improving a branch county road that leaves the State Road at Anderson's ranch and runs south to Hurricane. The purpose of this effort was to get a good wagon road from these fruit-growing towns to connect with the State Road, in order that the fruit crop might be hauled out of the Virgin and Ash Creek valleys to the northern markets without being so jammed and bruised as to make it unmarketable.

To encourage this work, the State Road Commission proposed that the funds originally required from the county out of the county general fund, should be permitted to go toward building this branch county road. The citizens of these towns, in view of the offer of the State, agreed to request the County Commissioners to create a special road district covering the territory traversed by the road. The petition of the people was submitted to the County Commissioners, but as the statute was express in specifying "graveling, macadamizing and paving" as the character of improvement that might be built from special road district taxes, but did not specifically mention grading as an improvement to be undertaken by these means, the County Commissioners refused to make a special road district as the petitioners requested.

A second objection was advanced against the creation of the district, to the effect that the district funds were, by the provisions of the law, to furnish only 25 per cent of the proposed outlay for the improvement of the road in the district, and that there was no apparent means of supplying the balance of the cost, except the amount of funds which the State Road Commission would have consented to have had applied on this work. Since this amount, viz.: \$500.00 was less than what the special district tax would

produce, there would have been left 50 per cent of the cost unprovided for. There existed no practicable means of taking care of this unprovided 50 per cent except through the county treasury. The county officers were absolutely opposed to having the county treasury provide for this outlay. This was the conclusive reason for not organizing a special road district in Washington County. The resistance of the county officers on the two grounds set out above, resulted in an abandonment of the effort to have any special road district created.

In the summer of 1912, a road from Anderson's ranch to Hurricane via Toquerville and La Verkin was designated as a State Road, and the five mill tax levied on the three precincts through which the road passes.

In October, 1912, State Road work was resumed in Washington County, beginning near the north boundary of the county at the southern terminus of the improvement made in 1910; citizen labor was used and the turnpike extended south toward Bellview 1.3 miles. Owing to freezing weather, work was stopped December at a point 13 miles down the Black Ridge dugway.

In November, 1912, sixty-six convicts were transferred to Washington County and camped near Anderson's ranch below Bellview. Since that time, they have been used to build the road northward from their camp and are now engaged in that work, the elevation here being considerably lower than the location where the citizen labor was used at the head of the Black Ridge and the formation more rocky, frost has not materially hindered operations here. During November, the convicts built .78 miles of very difficult road construction.

Should weather conditions become so severe as to seriously delay progress, it is proposed to move the camp to the vicinity of Leeds, still lower in elevation and more protected, where the convicts can be profitably employed until spring begins to open, when they may be moved back towards Bellview.

The matter of prime importance just now in Washington County is concentrating the road work as far as practicable between Anderson's ranch and the top of the Black Ridge, in order to connect the Virgin Valley with the roads the State has already built in the north end of Washington County, and the south end of Iron County. This work will serve primarily for the use of Leeds, Hurricane, La Verkin and Toquerville. If we are able to maintain our present force in the field, this work should be completed before the summer of 1913.

IRON COUNTY.

The State Road as designated in the south end of Iron County departed from the county road to the east less than one mile north of the south boundary of the county, following closely the escarpment of a limestone mountain, which extends practically north and south, the waste from which furnishes in place a very superior road material.

This designation necessitated the county commissioners obtaining certain rights-of-way, as a portion of this route crossed lands in private ownership. Some difficulty was experienced in dealing with these land owners, so that although we started the Iron County State Road work in 1910, to connect up with the Washington County work, which was begun in the same year, we were able to prosecute it only up to the point where the State Road designation departed from the old county road.

The right-of-way matter not having been settled at the time we reached this point, road work was transferred to the vicinity of Parowan, the balance of the work in 1910 being the construction of a road from Parowan westward towards Summit about six miles. In 1911 and 1912, the grade was completed from Parowan through Summit to Cedar City and all the culverts built.

The State Road immediately adjoining Cedar City on the north for about five miles has, compared with most of the roads in Iron County, a heavy traffic, the greater

part of the farming lands used by the Cedar City people lying adjacent to this road, so that the farmers living in town use it almost daily during the farming season, to go to and from their farms, and during the harvest season, to haul their crops from the fields into town.

This road adjacent to these farms, is for the most part sandy, so that it was necessary to provide something better than the material in place if a good road was to be had. In the adjacent hills to the east, near the road, there occurs a clayey shale. The road in the section described was topped with this shale. Where this work was done in dry weather and the supplied material thoroughly mixed with the sandy base and rolled, a good road resulted, which has stood up well and given good service.

During a portion of the time when this surfacing was being placed, the weather was wet and the mixing could not be, with the appliances had, at least was not thoroughly made and the road, as a consequence, has turned out somewhat inferior. The attempt to cure the bad places by resurfacing the sandy clay surface with a lime-shale material was ordered discontinued, the Commission having determined to try out thoroughly the sand-clay type of road before making any change and concluding that if any change of type was made it should cover practically the whole stretch of road that was subjected to this intensive use, and not in any case to be a patch-work job. Further attention is therefore needed on this stretch of road before it will be in acceptable shape to turn over to the county commissioners for maintenance.

During the summer of 1912, the rights-of-way necessary between the terminus of the 1910 construction in the south end of the county and Kanarra were obtained, and the road built as originally intended. While this road makes and loses considerable elevation along the new route over what could have been had in the matter of grade along the old county road, the road bed itself is so much more superior to what was possible in the old county road location, that notwithstanding the additional grades, a much larger load

can be pulled with the same horse-power over the new location than over the old county road location.

At this writing, the State Road work in Iron County has been discontinued owing to weather conditions. When work is resumed, it is expected that one road force will extend the State Road northward from Kanarra towards Cedar City, a second force will be used in building the State Road from the south limits of the Paragoonah precinct northward toward Paragoonah. The five mill tax was placed upon all of the precincts of Iron County through which the State Road passes, in 1912, except Parowan.

TABLES SHOWING BY COUNTIES:

**Road Construction,
Special Road Tax Levies,
Appropriations and Expenditures
1909--1912**

INTRODUCTION TO TABLES.

In the tables that follow is given a detailed report of tax levies, expenditures, and the work done on the State roads within each county up to December 1, 1912, under the supervision and direction of the State Road Commission. The work done on State Roads in each county has been grouped into two general tables, one showing the road construction, and the other the bridge and culvert construction. These tables, in turn, are subdivided into road precincts and years, thereby showing the amount of work done for each year within the road precincts of each county since the creation of the State Road Commission in 1909.

In the tables for road construction, one will note that all roads have been divided into two general classes, namely, Graded and Surfaced Roads. By a "Graded Road" is meant one in which the natural surface material of the ground is plowed up and shaped into a road having the desired crown and cross section; while a "Surfaced Road" is one which, in addition to the above, is surfaced for a portion of its width with some such material as gravel, shale, limestone, etc., so as to give the road a better wearing surface than the natural material of the ground would give. All roads that are graded and then surfaced are classified under "Surfaced Roads." In this way, the length of any piece of road constructed is not duplicated in the report. Under "Bridges" in the Bridge and Culvert tables are given the description and location of all bridges, and whenever possible, the cost of installing them. Under "Culverts" is given the type, number, size, and length of each culvert installed.

At the end of the construction tables for the various counties is given a general summary table showing for each county and for the different years the length of the various types of road built, the number and kind of bridges and culverts installed, the total expenditure, and the average cost per mile. In the total expenditure is included the cost of all bridges and culverts, road building equipment, and whatever struc-

tures that have been built in connection with road improvement. In securing the average cost per mile, the total mileage of road improved within any county was divided into the total expenditures for that county for the different years. A fair comparison of the cost of constructing roads within the different counties cannot, however, be made from this table for the reason that the total mileage and expenditures in one county may include a number of miles of surfaced or macadam road, several steel bridges, etc., while the average cost per mile for another county may be only the grading of a number of miles of earth road. In order to study in detail the work done in any one county, recourse must be had to the construction tables for that county.

Following the construction tables is a table showing, by road precincts, the special road tax levy in each county for the different years; also the total receipts from these levies for those years. The receipts shown for the 1912 levy are estimated amounts, and are based upon the assessed tax valuation of the road precincts within which the tax was levied.

In the tables showing the finances of each county, all State appropriations and expenditures for the different years have been segregated from those of the county, so that a comparison of State and county appropriations may be made. At the bottom of the "Disbursements" are shown items for unpaid labor and purchases. These are for bills and pay-rolls incurred prior to December 1, 1912, and which, up to that time, had not been approved for payment by the Commission. The "Summary" table at the end of these tables gives, at a glance, the appropriations, expenditures, and balance on hand for each county.

TABLES SHOWING ROAD CONSTRUCTION BY COUNTIES

BEAVER COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	ROAD GRADED.				ROAD SURFACED.							
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Beaver	31.10	1910	2.67	Earth Earth	30 75	1.46 0.50	No No	*Earth *Earth	30 75	0.43 0.28	30 75	4 to 24 4 to 24	Gravel Gravel	No No
		1911												
Adamsville	10.63	1910	6.21 4.00	Earth Earth	30 30	5.72 4.00	No No	Earth	30	0.49	30	8 to 18	Gravel	No
		1911												
Greenville	8.48	1910	4.15	Earth	30	4.15	No	Earth	30	0.89	12	8	Gravel	No
		1911												
Minersville	7.08	1910	3.56	Earth	30	3.56	No	Earth	30	2.09	2.09			
		1911												
Milford	3.02	1910	2.52	Earth	30	1.63	No	Earth	30					
		1911												
Total	60.31		30.68			28.59								
		1912												

*Road low in center and had to be filled by hauling material.

BEAVER COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

BRIDGES.										CULVERTS.			
Precinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Beaver.....	Cor. Iron	1912	3	24"	23	None
	Cem. Pipe	1912	1	12"	36	1
	Concrete	1912	1	24" x 12"	36	1
	Concrete	1912	1	30" x 18"	36	1
Adamsville..	Concrete	1912	1	72" x 21"	35	1
	Cor. Iron	1911	4	12"	30	None
	Cor. Iron	1911	8	18"	30	None
	Cor. Iron	1911	5	24"	26	None
Greenville..	Cor. Iron	1912	2	12"	32	None
	Cor. Iron	1912	8	18"	26	None
	Cor. Iron	1912	4	24"	28	None
	Cor. Iron	1910	1	18"	26	None
	Cor. Iron	1910	5	24"	28	None
	Cor. Iron	1911	7	12"	28	None
	Cor. Iron	1911	6	18"	30	None
	Cor. Iron	1911	1	24"	28	None

BOX ELDER COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Feet	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Willard	8.00	1910	0.75	.....	.....	.....	.....	Macadam	34	0.75	14	14	Granite and Quartzite	Yes
		1911 1912	2.25	.....	.....	.....	.....	†Macadam	34	2.25	14	14	Quartzite	Yes
Ferry	3.00	1910	2.00	.....	34	2.00	No	Earth	34					
		1911 1912	0.60	.....	34	0.60	No	Earth						
Brigham	9.00	1910	2.30	.....	34	0.30	No	Gravel	34	2.00	14		Gravel	No
		1911 1912	0.70	.....	34	0.70	No	Gravel						
Mantua	3.00	1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fielding or Malad	3.00	1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bear River	4.00	1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Elwood	4.00	1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tremonton	4.00	1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rawlins	10.00	1910	3.50	.....	34	3.50	No	Earth	34	.....	.....	.....	.....	.....
		1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

BOX ELDER COUNTY.—ROAD CONSTRUCTION—Continued.

Precinct	Miles of State Road	Year	ROAD GRADED.				ROAD SURFACED.									
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Roll		
Plymouth	5.00	1910 1911 1912														
Riverside	6.00	1910 1911 1912	3.00	Earth	34	3.00	Yes									
Portage	5.00	1910 1911 1912	2.00	Earth	34	2.00	No									
Howell or Blue Creek	10.00	1910 1911 1912														
Garland	3.00	1910 1911 1912	2.20	Earth	24	1.00	No	Concrete	24	1.20	9	6	Concrete	Yes		
Curlew and Kelton	34.00	1910 1911 1912	3.00	Earth	24	2.00	No									
*Park Valley and Rosette	25.00	1910 1911 1912														
*Lacin	35.00	1910 1911 1912														
Total	171.00		22.20			16.10										6.20

*Thirty-five miles of new road have been constructed within these two precincts by raising the sag in wash.
*Convict labor.

BOX ELDER COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

BRIDGES.

CULVERTS.

Precinct	Location	Year	Type	BRIDGES.		Kind of Abutments	Width of Roadway in Feet	Cost	CULVERTS.			
				Span in Feet	Type				Number	Year	Type	Average Length in Feet	No. with Headwalls
Perry.....	Box Elder Creek.	1912	Con. Arch	30	Concrete	18	\$ 800.00	1	1910	Cor. Iron Concrete	34	None
Box-Elder..	Box Elder Creek..	1912	Con. Arch	30	Concrete	18	800.00	4	1910		34	
	Box Elder Creek..	1910	Con. Arch	30	Concrete	18	1000.00					
Park Valley	.....	1912	Wood	12	Wood	18	.....			(8 in Num, ber)		
		1912	Wood	30	Concrete	18	.....			(8 in Num- ber)		
Curlew.....	.....	1912	Wood	12	Wood	18	.....			(1 in Num- ber)		
		1912	Wood	6	Wood	18	.....			(12 in Num- ber)		
Lucin.....	.....	1912	Wood	6	Wood	18	.....				
Snowville...	Deep Creek.....	1912	Con. Arch	30	Concrete	16	.....				

CACHE COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Greenville	1.00	1910 1911 1912	1.00	.....	.....	.....	.....	Earth	64	1.00	14	8	Gravel	No
Hyde Park	3.00	1910 1911 1912	.08 1.91	.....	64	1.45	No	Earth Earth	64 64	0.08 0.46	14 14	8 8	Gravel Gravel	No No
Wellsville	11.05	1910 1911 1912	.72 1.50	.....	.....	.....	.....	Earth Earth	36 36	0.72 1.50	14 14	18 8	Gravel Gravel	No No
College	2.07	1910 1911 1912	.78	.....	.....	.....	.....	Earth	36	0.78	14	18	Gravel	No
Providence	2.46	1910 1911 1912	1.50 .39	.....	.....	.....	.....	Earth Earth	36	1.50	14	16	Gravel	No
Richmond	5.10	1910 1911 1912	1.93	.....	.....	.....	.....	Earth	.....	0.39	.....	13	Gravel	No
Smithfield	4.10	1910 1911 1912	.50 .65	.....	.....	.....	.....	Earth Earth	30 36 36	1.93	14 14 14	10 10 10	Gravel Gravel Gravel	No No No
Mt. Sterling	1.15	1910 1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cove and Mt. Home	3.05	1910 1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	32.98	.....	10.96	.....	.....	1.45	.....	.....	.....	.....	.....	.....	.....	.....

*In co-operation with City of Smithfield.

CACHE COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
College.....	Hyrum Slough...	1912	Concrete	8	Concrete	60	.....	Cor. Iron	1911	3	18"	34	None
Smithfield..	Logan-Smith-field Canal.....	1912	Concrete	12	Concrete	34	.....					
	Smithfield Canal.	1912	Concrete	16	Concrete	60	.....					
Providence.	Logan River.....	1912	Concrete Abutments		Concrete		.....					

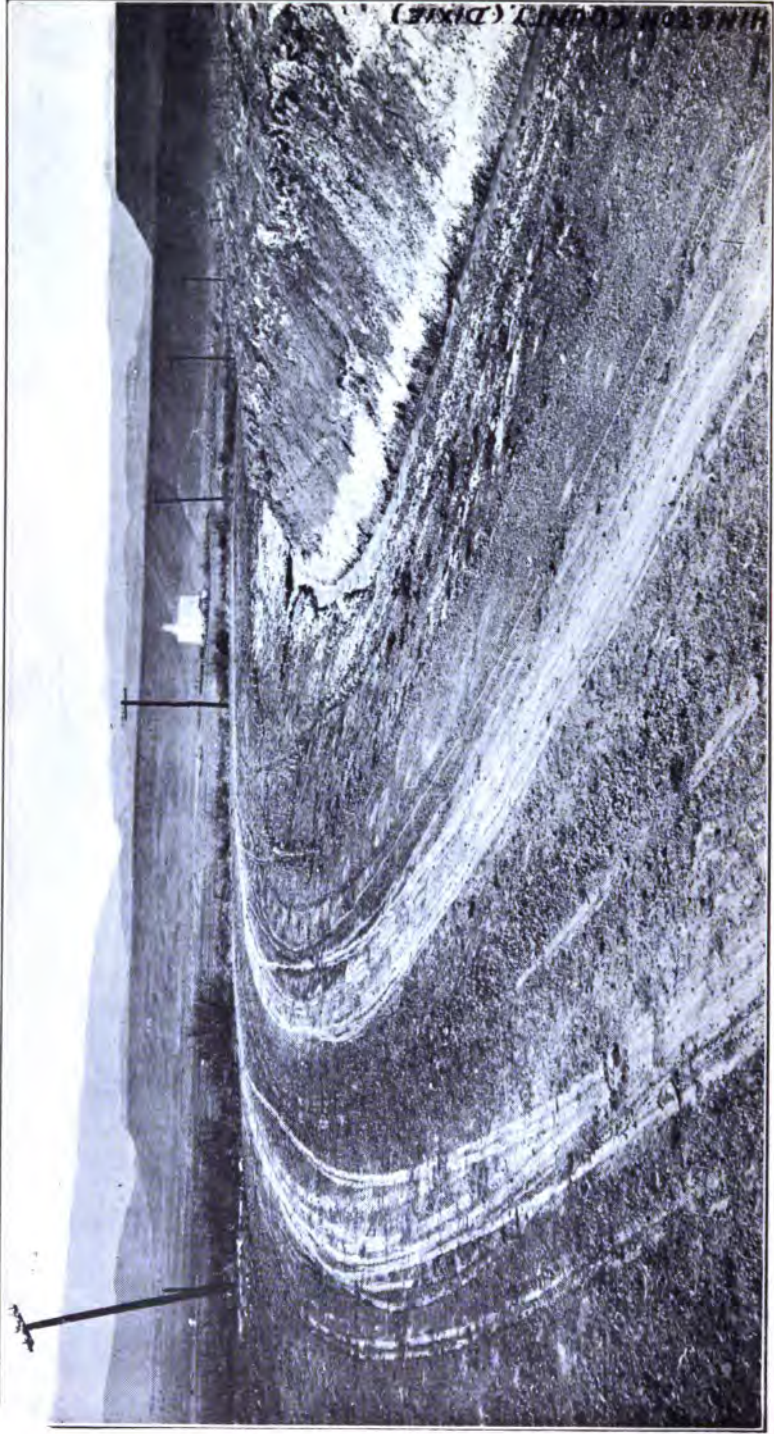
CARBON COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Feet	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Castle Gate	10.00	1910	2.90	Earth	17	2.90	No							
		1911												
Kenilworth	0.50	1910	0.30	Earth	17	0.30	No							
		1911												
Helper	2.00	1910	0.80	Earth	17	0.80	Yes							
		1911												
Spring Glen	2.50	1910	0.80	Earth	17	0.80	Yes							
		1911												
Carbonville	3.50	1910	0.80	Earth	17	0.80	Yes							
		1911												
Price	8.50	1910	3.00	Earth	40	3.00	No							
		1911												
Wellington	15.00	1910	2.50	Earth	17	2.00	Yes							
		1911												
		1912												

CARBON COUNTY.—ROAD CONSTRUCTION—Continued.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.										
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Feet	Length in Road in Miles	Width Surfacd in Feet	Depth in Inches	Kind of Surfacing Material	Rolled				
Sunnyside	14.50	1910 1911 1912																
Hiawatha	6.80	1910 1911 1912	5.50	Earth	17	5.50	Yes											
Total	63.80		21.30					21.30										

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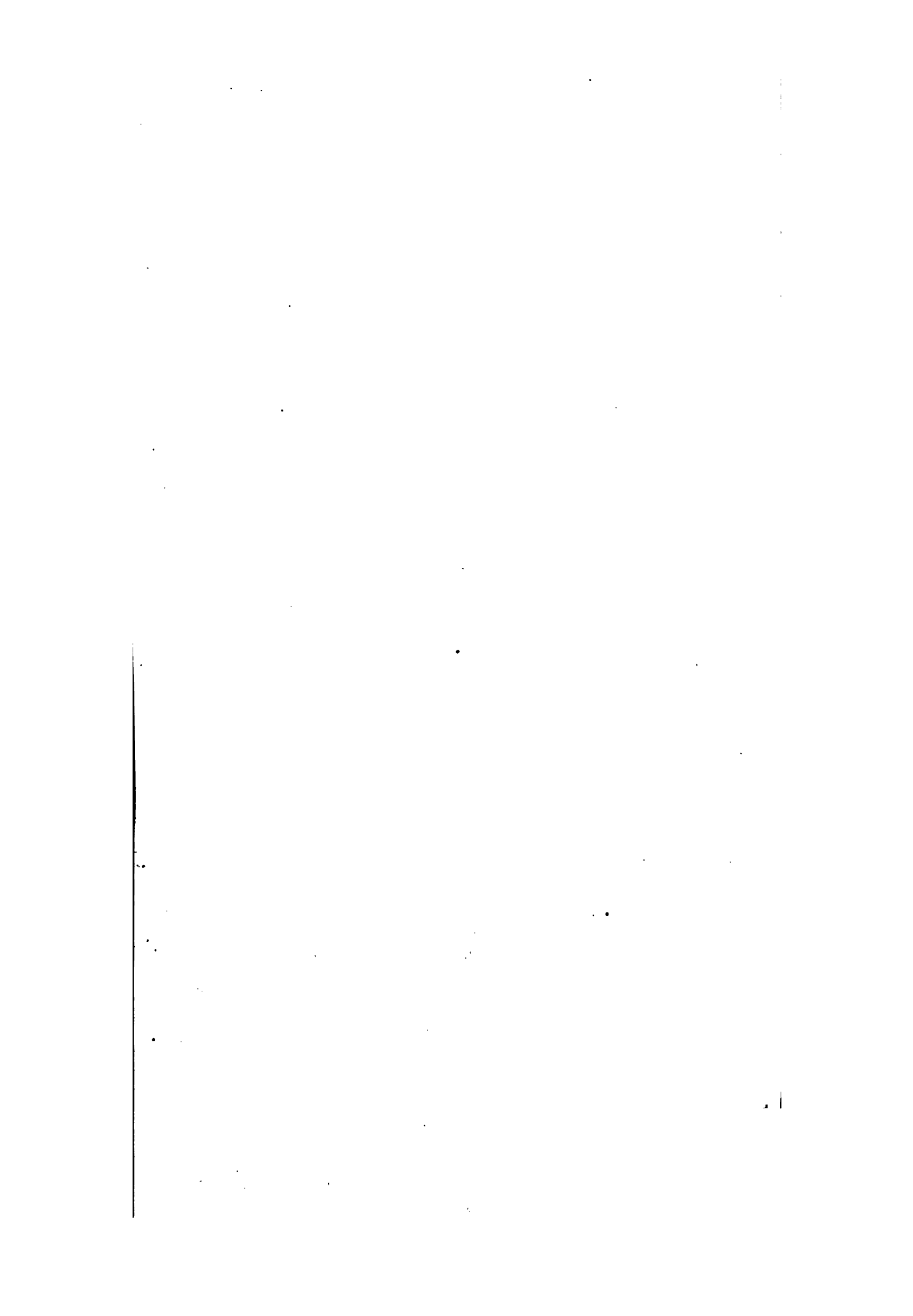


State Road Entering St. George, Washington County.
Showing Temple in the Distance.



State Road Between St. George and Middleton, Washington County.

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- * Mining Camps
- ~ Desert
- ~ Marsh or Slough
- ~ Lakes or Ponds
- ~ Mountains

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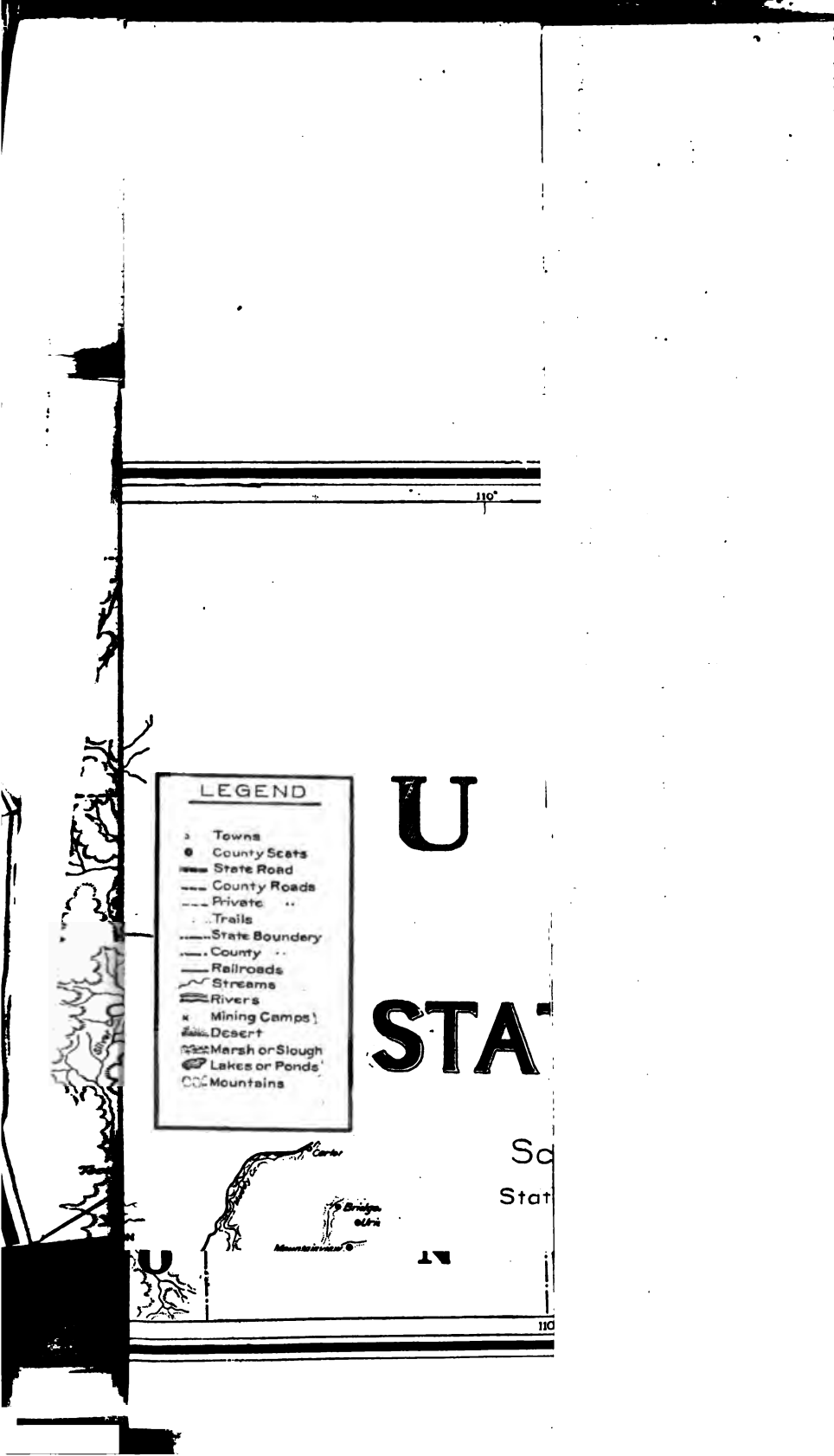
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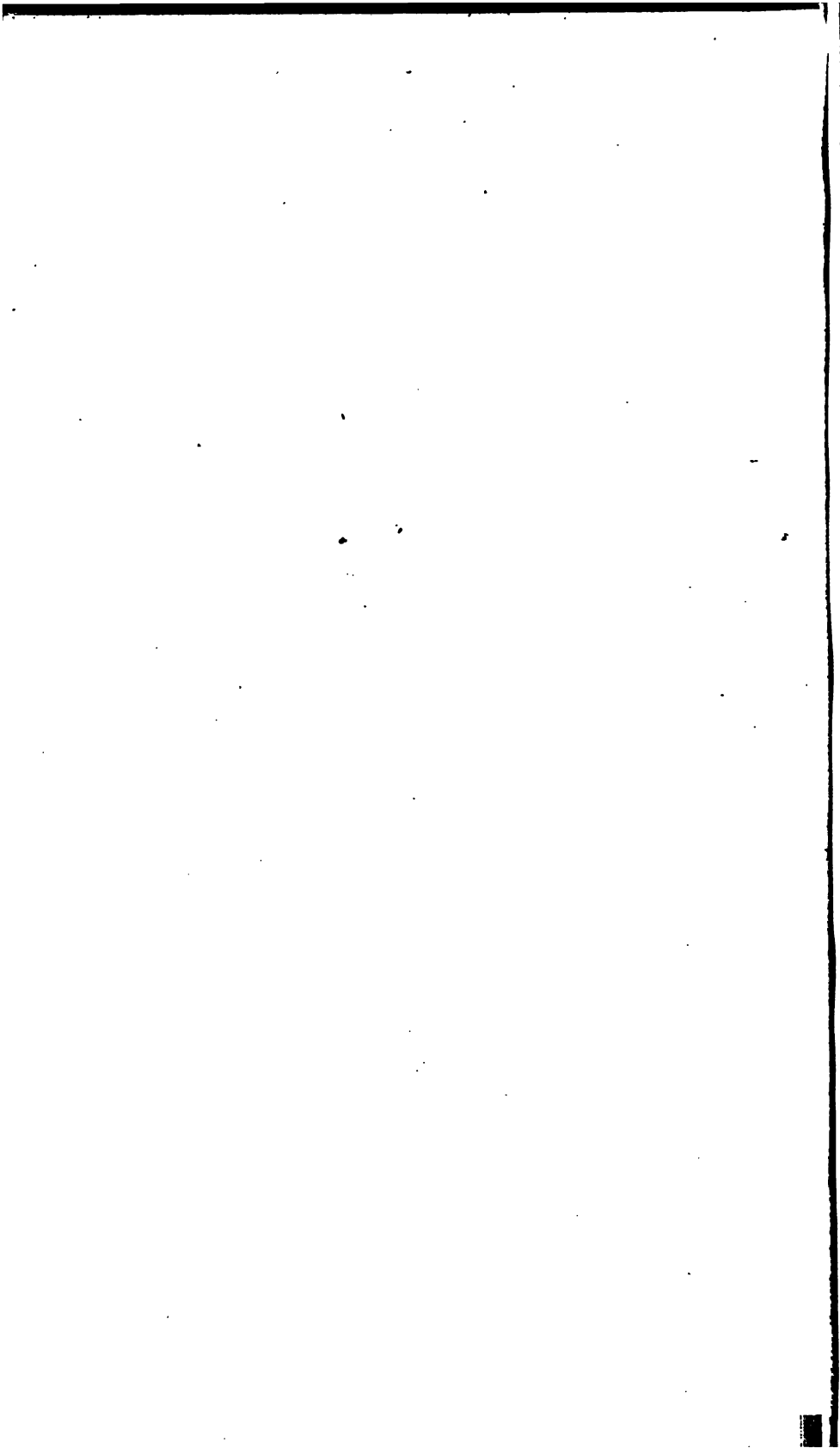
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CARBON COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Price.....	Mead's Wash.....	1912	Steel	18	Concrete	16	\$2000.00	Cor. Iron	1912	21	12"	34	None
	Price Canal.....		Wood	6	Concrete	16	50.00	Cor. Iron	1912	3	18"	22	None
	Frandsen Wash..		Concrete	6	Concrete	16	200.00	Cor. Iron	1912	1	20"	18	None
	Horsley Wash		Steel	14	Concrete	16	1000.00	Cor. Iron	1912	1	24"	34	None
	Cloudy Well Wash.....		Steel	18	Concrete	16	2500.00						
	Mathis Wash.....		Wood	35	Concrete	16	250.00						
Hiawatha...	Seap Wash.....		Wood	20	Concrete	16	200.00						
	Price Canal.....	1912	Wood	12	Concrete	16	200.00	Cor. Iron	1912	5	12"	20	None
	Price Canal.....		Wood	12	Concrete	16	200.00	Cor. Iron	1912	3	18"	24	None
Carbonville.	R. R. Wash.....	1912	Wood	5	Concrete	16	125.00	Cor. Iron	1912	1	24"	30	None
								Cor. Iron	1912	9	12"	18	None
Wellington.								Cor. Iron	1912	2	18"	30	None
								Cor. Iron	1911	14	12"	20	None
								Cor. Iron	1911	5	18"	20	None
Spring Glen.								Cor. Iron	1911	3	24"	22	None
								Cor. Iron	1912	1	12"	14	None
Castle Gate.	Willow Creek....	1911	Wood	20	Stone	16	1200.00	Cor. Iron	1912	3	24"	22	None
								Cor. Iron	1912	3	24"	22	None

DAVIS COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width in Road in Feet	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
South Bountiful ..	3.76	1910	1.02	Earth	30	1.02	No	Earth	30	0.21	16	8	Gravel	No
		1911												
East Bountiful ..	2.60	1910	2.60	Earth	36	0.24	No	Bo'lders and Gravel	30	0.81	No	No	Gravel	No
		1911												
Centerville	3.24	1910	0.81	Bo'lders and Gravel	30	0.81	No	Bo'lders and Gravel	30	0.43	No	No	Gravel	No
		1911												
Farmington	5.37	1910	0.21	Bo'lders and Gravel	30	0.43	No	Bo'lders and Gravel	30	1.75	No	No	Gravel	No
		1911												
Kaysville, Layton	5.32	1910	0.89	Bo'lders and Gravel	30	1.41	No	Bo'lders and Gravel	30	0.66	No	No	Gravel	No
		1911												
16th Precinct	1.97	1910	1.02	Sand	30	1.02	No	Sand	30	0.89	14	8	Gravel	No
		1911												
16th Precinct	1.97	1910	1.97	Clay	30	1.97	No	Clay	30	0.33	14	8	Gravel	No
		1912												
16th Precinct	1.97	1910	1.97	Clay	30	1.97	No	Clay	30	0.33	14	8	Gravel	No
		1912												

DAVIS COUNTY.—ROAD CONSTRUCTION—Continued.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Clearfield	2.44	1910	1.18	.....	.....	.....	.....	Sand	30	1.18	24	8	Clay	No
		1911	1.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1912		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Clinton	1.88	1910	1.15	.....	.....	.....	.....	Sand	36	1.15	18	8	Gravel	No
		1911	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1912	0.73	Sand	30	0.73	24	8	Gravel	No
South Weber	7.54	1910
		1911
		1912
Total	34.12	20.31	15.22

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DAVIS COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span In Feet	Kind of Abutments	Width of Roadway In Feet	Cost	Type	Year	Number	Size	Average Length In Feet	No. with Headwalls
South Bountiful.	Cem. Pipe	1912	1	12"	36	None
	Cem. Pipe	1912	12	8"	30	12
East Bountiful.	Cem. Pipe	1912	2	10"	26	2
	Cem. Pipe	1912	1	12"	32	1
	Cor. Iron	1912	18	8"	30	18
	Cor. Iron	1912	14	10"	20	14
	Cor. Iron	1912	8	12"	44	8
	Concrete	1912	2	9'6"X3'6"	10	2
	Concrete	1912	1	3'0"X3'0"	10	1
	Concrete	1912	1	3'0"X4'0"	42	1
	Cem. Pipe	1912	6	8"	66	6
	Syphon }	1912	6			
Centerville.	Cem. Pipe	1912	2	12"	34	2
	Cem. Pipe	1912	5	12"	56	5
Farm'ngton.	Syphon }	1912	5			
	Cem. Pipe	1912	6	6"	20	2
	Cem. Pipe	1912	9	8"	26	8
	Cem. Pipe	1912	17	10"	30	17
	Cem. Pipe	1912	2	12"	36	2
	Cem. Pipe	1912	3	15"	26	1
	Cem. Pipe	1912	4	10"	44	4
	Syphon }	1912	4			
	Cem. Pipe	1912	11	12"	40	8
	Syphon }	1912	11	8"	32	4
	Cor. Iron	1912	12	10"	26	12
	Cor. Iron	1912	1	12"	48	1
	Cor. Iron	1912	1	1'3"X4'0"	48	1
	Concrete	1912	1		24	1

DAVIS COUNTY.—BRIDGE AND CULVERT CONSTRUCTION—Continued.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Kaysville—Layton...								Cem. Pipe	1912	1	15"	38	None
								Cem. Pipe Siphon	1912	1	8"	116	1
16th Precinct..								Cem. Pipe Siphon	1912	2	12"	47	1
								Cem. Pipe Siphon	1912	2	15"	36	2
								Cor. Iron	1912	9	10"	20	None
								Cem. Pipe	1912	1	16"	36	None
Clearfield								Cor. Iron	1912	1	16"	30	None
								Cem. Pipe	1911	1	12"	60	None
								Cor. Iron	1911	2	10"	34	None
Clinton.....								Cor. Iron	1911	1	12"	80	None
								Cor. Iron	1911	1	10"	80	None

NOTE—There has also been constructed, in 1912, two sprinkling systems; one 5.16 miles long, extending through Clearfield and 16th Precinct and into Kaysville, Layton and Clinton Precincts and the other in Centerville Precinct, 1.70 miles long.

EMERY COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.					
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Elmo	5.58	1910	5.58	Clay Gravel	25	5.42	No						
		1911					No						
		1912					No						
Cleveland	1.62	1910	0.26	Gravel	25	0.26	No						
		1911											
		1912											
Huntington	8.60	1910	8.60	Sand Clay Gravel	25	0.50	No						
		1911					No						
		1912					No						
Castledale	7.20	1910	7.20	Clay Gravel	25	6.70	No						
		1911					No						
		1912					No						
Orangeville	0.46	1910	0.46	Clay	25	0.46	No						
		1911											
		1912											
Clawson	6.39	1910	6.39	Sand Clay Gravel	25	0.25	No						
		1911					5.66						
		1912					0.48						
Ferron	10.64	1910	10.64	Clay	25	10.64	No						
		1911											
		1912											

EMERY COUNTY—ROAD CONSTRUCTION—Continued.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.									
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled			
Emery	9.22	1910 1911 1912	5.12	Clay Gravel	25 25	4.47 0.65											
Green River	59.40	1910 1911 1912															
Woodside	6.00	1910 1911 1912															
Total	115.11	.....	43.75	.....	.....	43.75											

NOTE—Construction work cannot be segregated into the different years.

EMERY COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

BRIDGES.										CULVERTS.				
Precinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls	
Elmo.....	Wash.....	1912	Wood	17	Concrete	16	\$ 260.00	Cor. Iron	1912	19	24"	24	None	
	Wash.....	1912	Wood	14	Concrete	16	260.00							
Huntington.	Wash.....	1909	Wood	18	Stone	16	150.00	Cor. Iron	1911	1	12"	18	None	
	Wash.....	1909	Wood	16	Cribbing	14	50.00	Cor. Iron	1912	6	24"	28	None	
	Wash.....	1909	Wood	14	Cribbing	14	125.00							
	Huntington Crk.	1909	Steel	86	Steel	16	5425.00							
	Wash.....	1909	Wood	12	Earth	16	20.00							
	Wash.....	1910	Wood	12	Earth	16	20.00							
	Cedar Creek.	1910	Wood	36	Cribbing	16	440.00							
	Wash.....	1910	Wood	11	Stone	16	35.00							
	Wash.....	1910	Wood	17	Earth	16	35.00							
	Wash.....	1912	Wood	15	Concrete	18	175.00							
Castle Dale.	Canal.....	1909	Wood	9	Earth	16	30.00	Cor. Iron	1911	5	16"	18	None	
	Wash.....	1910	Wood	19	Cribbing	16	150.00	Cor. Iron	1911	1	12"	18	None	
	Canal.....	1910	Wood	9	Earth	14	30.00	Cor. Iron	1911	2	18"	18	None	
	Cottonwood Crk.	1910	Steel	107	Timber	16	6900.00							
	Wash.....	1910	Wood	30	Piles	16	80.00	Cor. Iron	1912	4	24"	20	None	
	Wash.....	1910	Wood	25	Stone	14	250.00							
Clawson.....	Canal.....	1909	Wood	13	Earth	14	25.00	Cor. Iron	1911	2	18"	18	None	
	Wash.....	1909	Wood	16	Cribbing	16	75.00							
	Wash.....	1910	Wood	25	Cribbing	16	175.00							
	Canal.....	1910	Wood	14	Earth	16	30.00							
	Canal.....	1911	Wood	15	Earth	16	30.00							
	Canal.....	1911	Wood	17	Earth	14	30.00							
	Canal.....	1911	Wood	10	Earth	14	30.00							

EMERY COUNTY.—BRIDGE AND CULVERT CONSTRUCTION—Continued.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Ferron.....	Wash.....	1909	Wood	28	Cribbing	14	75.00	Cor. Iron	1911	1	16"	18	None
	Ferron Creek.....	1910	Steel	36	Tubes	16	5425.00	Cor. Iron	1911	2	18"	18	None
	Wash.....	1910	Wood	14	Earth	16	30.00	Cor. Iron	1912	18	24"	22	None
	Canal.....	1911	Wood	17	Earth	16	36.00						
	Wash.....	1911	Wood	9	Earth	16	20.00						
	Wash.....	1911	Wood	12	Earth	16	25.00						
	Wash.....	1912	Wood	8	Earth	16	18.00						
	Canal.....	1912	Wood	12	Earth	18	27.00						
	Canal.....	1912	Wood	12	Earth	16	20.00						
	Canal.....	1912	Wood	12	Earth	16	20.00						

GARFIELD COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.									
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled			
Bear Creek	21.00	1910	2.15	Earth	18	2.15	No										
		1911	1.00	Earth	18	1.00	No										
		1912	5.50	Earth Sand Gravel	18 18 18	5.00 0.22 0.28	No No No										
Panguitch	14.00	1910															
		1911															
		1912															
Hillsdale	19.00	1910															
		1911															
		1912															
Total	54.00		8.65			8.65											

GARFIELD COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Bear Creek.	Dry Canyon Wash	1912	Wood	20	Rock	18	\$ 460.90	Concrete	1910	2	20" x 3'0"	16	2
								Concrete	1910	2	3'0" x 4'0"	16	2
								Cem. Pipe	1912	9	18"	20	5
								Cem. Pipe	1912	2	24"	20	2
								Concrete	1912	1	4'0" x 5'0"	20	1
								Concrete	1912	1	3'0" x 4'0"	20	1
								Concrete	1912	1	3'0" x 3'0"	20	1
								Concrete	1912	1	3'0" x 3'0"	20	2
								Rock	1912	1	7'0" x 6'0"	22	1

GRAND COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
No. 1	27.25	1910 1911 1912	3.00	Sand Earth	26 *18	1.25 0.63	No No	Sand	18	1.12	16	18	Clay	No
No. 2	74.50	1910 1911 1912	6.25 7.75 3.25	Earth Clay Earth	*18 38 18	6.75 6.43 2.75	No No No	Sand Sand Sand	18 38 20	0.50 1.50 0.50	16 16 20	18 18 18	Shale Shale Shale	No No No
No. 3	6.00	1910 1911 1912												
Total	107.75	.....	20.25	.....	.....	16.63	.....	.....	.....	8.62	.....	.....	.....	.....

*Dugway Construction.

GRAND COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

		BRIDGES.						CULVERTS.					
Preinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
No. 2.....	1910	Plank	16	Stone	14	\$ 125.00	Rock	1910	19	2'0"x1'6"	16	None
								Rock	1911	9	2'0"x2'0"	18	5
								Rock	1912	13	2'0"x2'0"	18	6
No. 1.....							Rock	1912	2	2'0"x2'0"	18	1

IRON COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.									
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled			
Paragoonah	22.40	1910 1911 1912															
Parowan	14.90	1910 1911 1912	4.40	Earth	30	4.40	Yes										
Summit	7.70	1910 1911 1912	1.60 4.70	Gravel Earth Gravel	30 30 30	1.60 1.20 3.50	Yes Yes Yes										
Enoch	2.60	1910 1911 1912	1.20	Gravel	30	1.20	Yes										
Cedar	61.60	1910 1911 1912	6.00	Gravel	30	4.40	Yes	Sand	40	1.60	26	6	Clay	Yes			
Kanarra	11.20	1910 1911 1912	3.70	Gravel	33	3.70	No										
Total	120.40		21.60			20.00				1.60							

IRON COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Parowan.....	Breakwater.....	1912	Wood	9	Cement	16	.....	Wood. Concrete	1909 1912	2	3'0"x1'0" 3'0"x2'0"	26 16	None None
Summit.....	.....	.....	.....	.....	.....	.....	.....	Cor. Iron Wood Wood Concrete Concrete Concrete	1912 1911 1911 1912 1912 1912	1 1 1 1 1 2	36" 3'6"x2'0" 2'6"x2'0" 3'6"x2'8" 4'0"x2'6" 3'0"x2'0"	20 16 16 16 16 16	1 None None None 1 1 2
Cedar.....	U. Fld. Canal..... U. Fld. Canal..... Coal Creek.....	1912 1912 1912	Wood Wood Wood	10 13 28	Cement Cement Cement	16 25 16	.....	Cor. Iron Concrete Concrete Concrete Concrete Concrete	1912 1912 1912 1912 1912 1912	1 2 3 1 4 2 1	12" 48" 3'0"x2'0" 2'6"x2'0" 2'6"x1'6" 3'6"x2'6" 3'6"x1'6" 4'4"x1'6"	18 20 16 16 16 27 16 16	None 2 3 1 4 4 2 2 1
Kanarra.....	Spring Creek..... Camp Creek.....	1912 1912	Wood Wood	12 16	Cement Cement	16 16	.....	Concrete Concrete Concrete Concrete Cor. Iron Cor. Iron	1912 1912 1912 1912 1912 1912	1 2 1 2 2 1	3'0"x2'0" 3'6"x1'6" 4'4"x1'6" 1'6"x2'0" 2'0"x3'6" 36" 48"	16 16 16 16 20 20 20	1 2 1 2 2 1 2 1

JUAB COUNTY—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Nephi	20.75	1910	3.25	Earth	42	2.50	No	Earth	42	0.75	14	8	Gravel	No
		1911	5.25	.....	.....	.....	.....	Earth	42	5.25	14	8	Gravel	Yes
		1912	4.25	Earth	42	2.50	No	Earth	42	1.75	14	8	Gravel	No
Mona	10.00	1910	9.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1912	1.00	.....	.....	.....	.....	Earth	42	9.00	14	8	Gravel	Yes
Levan	21.75	1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1912	3.75	Earth	42	3.75	Yes	.....	.....	1.00	14	8	Gravel	No
Eureka	5.00	1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1911	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	57.50	.....	26.50	.....	.....	8.75	.....	.....	.....	17.75	.....	.....	.....	.....

JUAB COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Nephi.....	*Salt Creek.....	1912	Concrete Slab	12	Rock	124	\$ 660.65	Cor. Iron	1910	1	18"	34	None
								Cor. Iron	1910	1	12"	34	None
								Cor. Iron	1910	2	8"	34	None
								Cor. Iron	1911	2	18"	34	None
								Cor. Iron	1911	3	16"	34	None
								Cor. Iron	1911	3	12"	34	None
								Cor. Iron	1911	1	8"	34	None
								Cor. Iron	1911	5	18"	34	None
								Cor. Iron	1912	3	12"	34	None
								Cor. Iron	1912	1	10"	34	None
								Cor. Iron	1912	1	12"	34	None
								Cem. Pipe	1910	1	5'0"x4'0"	36	None
								Concrete	1910	3	12"	34	None
								Cem. Pipe	1910	31	32"	34	3
								Cem. Pipe	1912	1	2'0"x1'0"	34	1
								Cem. Pipe	1912	2	4'0"x2'0"	36	1
								Cor. Iron	1911	10	18"	34	None
								Cor. Iron	1911	4	15"	34	None
								Cor. Iron	1911	19	12"	34	None
								Cor. Iron	1911	6	10"	34	None
								Cem. Pipe	1911	3	12"	34	None

ie Road Commission paid \$347.75 of total cost and Nephi City paid balance.

KANE COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

BRIDGES.				CULVERTS.								
Preinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Length in Feet	Material
Alton								Cor. Iron	1912	1	100	Stone
									1912		100	Stone
									1912		200	Stone

MILLARD COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Holden		1911	Wood	8	Stone	20	\$ 150.00	Cor. Iron	1910	3	12"	24	None
		1912	Wood	6	Concrete	20	164.00	Cor. Iron	1910	4	18"	24	None
		1910	Wood	10	Timber	16	50.00	Cor. Iron	1911	2	18"	30	None
Fillmore								Cor. Iron	1911	6	12"	26	None
								Cor. Iron	1911	4	18"	20	None
								Cor. Iron	1911	2	24"	36	None
								Cor. Iron	1911	1	36"	30	None
								Cor. Iron	1912	4	12"	20	None
Deseret		1912	Wood	10	Timber	20	50.00	Cor. Iron	1912	6	18"	20	None
		1912	Wood	10	Timber	20	50.00	Cor. Iron	1912	4	12"	20	None
Oasis								Cor. Iron	1912	6	18"	20	None
								Cor. Iron	1912	6	18"	20	None

MORGAN COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	ROAD GRADED.				ROAD SURFACED.							
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Peterson	7.50	1910	0.70	Clay	20	0.46	No	Clay	20	0.24	14	8	Gravel	Yes
		1911												
		1912	0.93					Earth	24	0.93	14	8	Gravel	Yes
Milton	6.20	1910												
		1911												
		1912	1.40					Macadam	24	1.40	14	9	Lime and Quartzite	Yes
Morgan	8.02	1910	0.10					Macadam	24	0.10	20	7	Lime and Quartzite	Yes
		1911						Macadam	24	1.00	14	9	Quartzite	Yes
		1912	1.00					Macadam	24	1.00	14	9	Quartzite	Yes
Croyden	4.47	1910	1.60					Earth	20	1.60	14	9	Gravel	Yes
		1911												
		1912												
Total	26.19		5.73							5.27				

MORGAN COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

BRIDGES.										CULVERTS.			
Preinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Peterson	Strawberry Crk. Cottonwood Slough	1910	Steel	20	Concrete	16	.....	Concrete	1912	1	5'0"x2'6"	30	1
		1910	Steel	40	Concrete	16	.....	Concrete	1912	1	1'0"x1'0"	24	1
		1912	Concrete	16
Milton	.....	.....	.....	.....	.....	.....	.....	Concrete	1912	2	6'0"x3'0"	24	2
		.....	.....	.....	.....	.....	.....	Concrete	1912	1	3'0"x2'0"	24	1
		.....	.....	.....	.....	.....	.....	Concrete	1912	3	1'0"x1'0"	24	1
Morgan	.....	.....	.....	.....	.....	.....	.....	Concrete	1912	1	5'0"x3'0"	20	1
		.....	.....	.....	.....	.....	.....	Concrete	1912	1	2'0"x2'0"	24	1
		.....	.....	.....	.....	.....	.....	Concrete	1912	17	1'0"x1'0"	22	17
		.....	.....	.....	.....	.....	.....	Concrete	1912	2	2'0"x2'0"	24	2
		.....	.....	.....	.....	.....	.....	Concrete	1912	1	1'6"x1'6"	24	1
		.....	.....	.....	.....	.....	.....	Concrete	1912	1	2'6"x2'0"	24	1
		.....	.....	.....	.....	.....	.....	Concrete	1912	1	4'0"x2'0"	24	1

PIUTE COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	ROAD GRADED.				ROAD SURFACED.						
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Circleville	3.50	1910	3.50	Earth	20	3.50	No						
		1911											
		1912											
Junction	8.24	1910	5.00	Earth	18	5.00	No						
		1911											
		1912											
Bullion and Marysvale	8.98	1910	2.30	Earth	18	2.30	No						
		1911											
		1912											
Greenwich	4.37	1910	4.37	Gravel	14	4.37	No						
		1911											
		1912											
Total	25.09	20.17	20.17

PIUTE COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

		BRIDGES.						CULVERTS.					
Precinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Circleville Junction	.....	.....	.....	.....	.....	.....	.....	Concrete	1912	3	1'6" x 1'6"	18	3
		.....	.....	.....	.....	.....	.....	Concrete	1910	2	3'0" x 4'0"	22	2
		.....	.....	.....	.....	.....	.....	Concrete	1912	1	1'6" x 1'6"	18	1
Bullion and Marysvale	Bullion Creek.....	.....	.....	.....	.....	.....	.....	Concrete	1912	1	2'0" x 2'0"	18	1
		.....	Concrete	10	Stone	18	\$ 320.60	Concrete	1910	1	1'0" x 1'0"	18	1
		.....	.....	.....	.....	.....	.....	Concrete	1912	1	1'0" x 2'0"	20	1
		.....	.....	.....	.....	.....	.....	Concrete	1912	5	1'6" x 1'6"	20	5
.....	.....	.....	.....	.....	.....	.....	Concrete	1912	1	4'0" x 4'0"	20	1	
.....	.....	.....	.....	.....	.....	.....	Concrete	1912	1	2'0" x 2'0"	20	1	

RICH COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	ROAD GRADED.					ROAD SURFACED.						
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Woodruff	14.30	1910	1.25	Earth	26	0.25	No	Earth	26	1.00	8	10	Gravel	No
		1911		Earth	26	0.74	No	Earth	26	1.00	8	10	Gravel	No
		1912												
Argyle	5.50	1910	1.75	Earth	26	0.25	No	Earth	26	1.50	8	10	Gravel	No
		1912	1.50	Earth	26	1.50	No	Earth	26	1.50	8	10	Gravel	No
Randolph	10.00	1910	3.00	Earth	26	2.00	No	Earth	26	1.00	10	10	Gravel	No
		1912	1.00	.....	.....	.....	.....	Earth	26	1.00	18	12	Gravel	No
Garden City	10.00	1910	2.50	Earth	24	1.25	Yes	Earth	24	1.25	14	10	Gravel	Yes
		1912	4.50	.....	.....	.....	.....	Earth	26	4.50	14	10	Gravel	Yes
Lake Town	12.33	1910	1.50	.....	.....	.....	.....	Earth	26	1.50	14	12	Gravel	Yes
		1912	0.70	Earth	26	0.70	Yes	Earth	26	0.91	14	18	Gravel	Yes
Total	52.13	.....	20.35	.....	.....	6.69	.....	.....	.....	13.66	.....	.....	.....	.....

RICH COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Woodruff...	Saluratis Creek..	1910	Steel	26	Concrete	16	\$ 390.97	Cor. Iron	1910	1	14"	26	None
	Saluratis Creek..	1910	Steel	16	Concrete	16	316.97	Cor. Iron	1911	2	12"	21	None
	8-Mile Hollow....	1912	Concrete	10	Concrete	16	275.00	Cor. Iron	1911	7	18"	18	None
Argyle.....								Cor. Iron	1911	1	12"	26	None
								Cor. Iron	1911	1	16"	26	None
								Cem. Pipe	1911	1	16"	26	None
								Cem. Pipe	1911	2	24"	26	None
								Cor. Iron	1912	2	8"	24	None
								Cor. Iron	1912	3	12"	24	None
								Cor. Iron	1912	1	14"	24	None
								Cor. Iron	1912	1	16"	24	None
Randolph.....								Cor. Iron	1912	2	24"	24	None
								Cor. Iron	1910	2	14"	28	None
								Cor. Iron	1910	2	16"	28	None
								Cor. Iron	1910	1	24"	28	None
Garden City.....								Cor. Iron	1912	2	8"	26	None
								Cor. Iron	1912	2	12"	24	None
								Cor. Iron	1912	15	16"	24	None
								Cor. Iron	1912	4	16"	24	None
								Cor. Iron	1912	1	18"	24	None
Lake Town.....								Cem. Pipe	1912	1	16"	24	1
								Cor. Iron	1911	1	12"	18	None
								Cor. Iron	1912	3	12"	20	None
								Cem. Pipe	1912	1	18"	24	2

SALT LAKE COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	ROAD GRADED.				ROAD SURFACED.										
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled				
No. 2	13.70	1910 1911 1912															
No. 3	2.40	1910 1911 1912															
No. 4	8.30	1910 1911 1912															
No. 5	5.30	1910 1911 1912	1.38	Earth	20	0.88	No	Earth	48	0.50	20	5	Gravel	No			
No. 6	2.00	1910 1911 1912															
No. 7	2.00	1910 1911 1912															
No. 8	6.50	1910 1911 1912	0.57					Macadam	84	0.57	24	8	Slag	No			
No. 9	2.00	1910 1911 1912	1.17					Macadam	84	1.17	20	10	Slag	No			
No. 11	3.80	1910 1911 1912	0.50					Gravel	30	0.50	30	6	Sand	No			
Total	46.00		3.62			0.88				2.74							

NOTE—In addition there has been 17.75 miles of State Road surfaced with slag by County prior to 1909.

SAN JUAN COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

BRIDGES.										CULVERTS.				
Precinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls	
Bluff.....	5-Mile.....	1912	Wood	12	Rock	16	\$ 50.00	Rock	1911	1	3'0" x 3'0"	18	1	
Grayson....	Jacob's Well.....	1911	Wood	13	Rock	16	60.00	Cor. Iron Rock	1912 1911	1 1	18" 2'0" x 2'0"	20 18	None 1	
Monticello..	Song Canyon..... Bridge Canyon..	1912 1912	Wood Wood	16 25	Log Log	16 16	75.00 250.00	Cor. Iron Rock	1912 1912 1912	2 1 1	12" 18" 2'0" x 2'0"	24 24 16	1 1 1	

SAN PETE COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Gunnison	12.38	1910	1.60	Earth	30	0.70	No	Clay	30	0.90	14	8	Sand	No
		1911	7.10	Earth	48	1.50	No	Clay	30	0.15	14	24to48	Sand	No
		1912		30	5.60	No								
Sterling	7.04	1910	1.06	Earth	30	1.00	No	Earth	30	0.30	14	12to24	Gravel	No
		1911	3.50	Earth	30	3.85	No							
		1911	2.10	Earth	30	1.30	No							
		1912	2.10	Gravel	30	0.20	No							
Manti	8.01	1910	2.30	Earth	30	0.60	No	Earth	30	0.30	14	12to24	Gravel	No
		1911	0.80	Gravel	30	1.10	No							
		1912	3.10	Gravel	36	0.80	No							
Ephraim	7.88	1910	1.10	Gravel	36	1.10	No	Earth	30	0.30	14	12to24	Gravel	No
		1911	1.60	Gravel	30	1.60	No							
		1912	3.10	Gravel	30	3.10	No							
Chester	6.60	1910	4.10	Gravel	30	4.10	No	Earth	30	0.40	14	12	Sand	No
		1911	1.10	Gravel	36	1.30	No							
		1912													30	2.60	No
Meadowville	1.10	1910	1.00	Gravel	30	0.60	No	Clay	30	0.40	14	9	Gravel	No
		1911	4.00	Gravel	36	1.30	No							
		1912													30	2.60	No
Moroni	6.42	1910	1.00	Gravel	30	0.60	No	Earth	30	0.10	14	9	Gravel	No
		1911	4.00	Gravel	36	1.30	No							
		1912													30	2.60	No

SAN PETE COUNTY—ROAD CONSTRUCTION—Continued.

Precinct	Miles of State Road	Year	ROAD GRADED.				ROAD SURFACED.							
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Fountain Green ..	10.37	1910 1911 1912	3.05	Earth & Gravel	30	3.05	No							
Spring City	6.81	1910 1911 1912	1.80	Earth Rock*	30	1.06 0.24	No No							
Mt. Pleasant	5.72	1910 1911 1912	0.35	Rock*	30	0.35	No							
Pleasant View ...	2.10	1910 1911 1912	3.70	Earth Rock*	30	1.76 1.94	No							
Fairview	5.52	1910 1911 1912	0.80											
Millburn	8.22	1910 1911 1912						Clay	30	0.80	14	18	Sand	No
Indianola	6.68	1910 1911 1912												
Total	94.85		45.60			42.95				2.65				

*Rock and Boulder work.

SAN PETE COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.							
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls	
Gunnison.....								Cem. Pipe	1910	2	12"	18	None	
								Cem. Pipe	1911	9	18"	20	3	
								Concrete	1912	1	6'0"x8'0"	30	1	
								Concrete	1912	1	4'0"x6'0"	30	1	
								Concrete	1912	1	5'0"x3'0"	28	1	
								Concrete	1912	1	5'0"x2'0"	28	1	
								Concrete	1912	4	4'0"x2'0"	28	4	
								Concrete	1912	7	4'0"x1'6"	28	6	
								Concrete	1912	4	3'0"x1'8"	28	4	
								Concrete	1912	2	2'8"x2'0"	28	2	
								Concrete	1912	14	2'6"x1'6"	28	14	
	Sterling....	Highland Canal..	1911	Wood	16	Concrete	30	Cem. Pipe	1910	2	12"	18	None
									Cem. Pipe	1911	4	12"	18	None
									Concrete	1911	3	2'0"x2'0"	20	3
								Concrete	1912	10	2'0"x1'6"	28	10	
								Concrete	1912	1	1'6"x1'6"	28	1	
Manti.....								Cem. Pipe	1910	5	12"	18	None	
								Cem. Pipe	1910	4	18"	18	None	
								Concrete	1910	2	1'6"x1'6"	20	None	
								Concrete	1912	2	1'2"x1'2"	28	1	
								Concrete	1912	6	1'6"x1'6"	28	6	
								Concrete	1912	6	1'6"x1'6"	28	6	
Ephraim.....								Cem. Pipe	1910	6	12"	18	None	
								Cem. Pipe	1910	9	18"	18	None	
								Cor. Iron	1911	1	12"	18	None	
								Cor. Iron	1911	2	18"	17	None	
								Concrete	1912	8	1'6"x1'6"	28	8	

SAN PETE COUNTY.—BRIDGE AND CULVERT CONSTRUCTION—Continued.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Chester.....								Cem. Pipe	1910	15	12"	18	None
								Cem. Pipe	1910	6	18"	18	None
								Cem. Pipe	1911	1	12"	18	None
								Cem. Pipe	1911	1	18"	18	None
Moroni.....	Sanpitch River...	1912	Wood	20	Concrete	16		Cem. Pipe	1910	9	12"	18	None
	City Canal.....	1912	Wood	5	Cement	48		Cem. Pipe	1910	3	18"	18	None
								Cor. Iron	1912	12	12"	30	None
								Concrete	1912	1	3'0"X5'0"	24	1
								Concrete	1912	2	10'0"X3'0"	24	2
Spring City.								Cem. Pipe	1910	10	12"	18	None
								Cem. Pipe	1910	4	18"	18	None
								Concrete	1911	1	2'0"X2'0"	24	1
								Concrete	1912	3	2'0"X2'0"	28	3
								Concrete	1912	1	1'6"X1'6"	28	1
Mount Pleasant..								Concrete	1910	1	1'6"X1'6"	30	None
								Concrete	1910	2	2'0"X2'0"	20	2
								Cem. Pipe	1910	3	12"	20	None
								Cem. Pipe	1910	4	12"	18	None
								Concrete	1912	21	1'6"X1'6"	28	21
								Concrete	1912	2	1'3"X1'3"	28	2
								Concrete	1912	2	2'0"X2'0"	28	2
								Concrete	1912	1	2'6"X2'6"	20	1
Pleasant View.....								Cem. Pipe	1910	8	12"	18	None
								Cem. Pipe	1910	8	18"	18	None
								Concrete	1912	1	3'0"X3'0"	20	1
								Concrete	1912	1	4'0"X2'6"	28	1
								Concrete	1912	1	2'4"X2'0"	20	1
								Concrete	1912	1	1'6"X1'6"	28	1

SAN PETE COUNTY.—BRIDGE AND CULVERT CONSTRUCTION—Continued.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Fairview...								Cem. Pipe	1910	5	12"	18	None
								Concrete	1911	1	2'0" x 2'0"	24	1
								Concrete	1912	1	3'0" x 6'0"	20	1
								Concrete	1912	1	2'0" x 2'0"	24	1
Milburn.....								Concrete	1912	1	2'6" x 2'6"	24	1
								Cem. Pipe	1910	5	12"	18	None

SEVIER COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Redmond	3.60	1910	0.64	.....	.....	.....	.....	Clay	30	0.64	10	6	Gravel	No
		1911	2.22	Clay	30	2.22	No							
		1912												
Salina	*48.70	1910	4.60	Clay	30	3.09	No	Clay	30	1.51	10	6	Gravel	No
		1912												
Aurora	4.10	1910	2.01	Clay	30	2.01	No	Clay	30	1.51	10	6	Gravel	No
		1911	1.51	.....	.....	.....	.....			
		1912												
Vermillion	2.80	1910												
		1911	2.89	Clay	30	2.74	No	Clay	30	0.15	10	6	Gravel	No
		1912												
Sigurd	5.20	1910												
		1911	3.15	Clay	30	3.15	Yes							
		1912												
Venice	2.50	1910	2.37	.....	.....	.....	.....	Clay	30	2.37	9	6	Gravel	Yes
		1911												
		1912												
Richfield	10.20	1910	4.22	Clay	35	2.65	Yes	Clay	35	1.57	10	6	Gravel	Yes
		1911												
		1912	2.61	Clay	35	2.61	No							

SEVIER COUNTY.—ROAD CONSTRUCTION—Continued.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.									
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled			
Elsinore	4.80	1910 1911 1912	1.45	Clay	35	1.45	No										
Cove	20.30	1910 1911 1912	2.00	Earth	30	2.00	No										
Glenwood	11.30	1910 1911 1912	1.50	Earth	30	1.50	No										
Joseph	5.90	1910 1911 1912	0.13	Earth	30	0.13	No										
Monroe	2.00	1910 1911 1912															
Burrville	16.70	1910 1911 1912	1.50	Earth	30	1.50	No										
Koosharem	5.70	1910 1911 1912															
Total	146.60		32.80			25.05										7.75	

*42.00 miles of this is Salina Canyon Road.

SEVIER COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Salina.....	Denmark Wash..	1910	Timber	22	Concrete	16	.....	Concrete	1910	3	17"x21"	20	3
Aurora.....	Vermillion Canal.	1910	Timber	18	Rock	16	.....	Concrete	1910	16	17"x21"	20	16
Vermillion..	Vermillion Canal.	1912	Timber	16	Concrete	16	\$ 205.72	Concrete	1912	11	17"x21"	24	11
	Silver Gulch.....	1912	Timber	12	Concrete	16	149.12	Concrete	1912	10	17"x21"	24	10
	Vermillion Wash.	1912	Timber	16	Concrete	16	293.56	Concrete	1912	2	24"x30"	30	2
Venice.....	Vermillion Canal.	1912	Timber	18	Concrete	16	217.62	Concrete	1912	26	17"x21"	24	26
Richfield...	Richfield Canal..	1912	Timber	16	Concrete	16	.....	Cor. Iron	1912	1	18"	24	None
Elsinore....	Richfield Canal..	1912	Timber	20	Concrete	18	182.51	Concrete	1912	13	17"x21"	24	13
Sigurd.....	.....	.....	.....	.....	.....	.....	.....	Concrete	1912	27	17"x21"	24	27
Central.....	.....	.....	.....	.....	.....	.....	.....	Cor. Iron	1912	2	12"	24	None
Joseph.....	Jerico Wash.....	1912	Steel Stringer	22	Concrete	16	.....	Concrete	1912	2	17"x21"	24	2

SUMMIT COUNTY.—ROAD CONSTRUCTION—Continued.

Precinct	Miles of State Road	Year	ROAD GRADED.				ROAD SURFACED.							
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled	
Marion	4.00	1910	0.64	Earth	18	0.50	No	Earth	18	0.14	14	12	Gravel	No
		1911												
		1912												
Kamas	13.00	1910	3.30	Earth	18	2.20	No	Earth	18	1.10	14	12	Gravel	No
		1911												
		1912												
Snyderville	13.00	1910	0.60	Earth	18	0.30	No	Earth	18	0.30	14	8	Gravel	No
		1911												
		1912												
Park City	4.00	1910	2.20	Earth	18	2.20	No	Earth	18	0.30	14	8	Gravel	No
		1911												
		1912												
Castle Rock	11.50	1910	2.20	Earth	18	2.20	No	Earth	18	0.30	14	8	Gravel	No
		1911												
		1912												
Total	101.00		20.77			15.18				5.59				

SUMMIT COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Hoytsville.....								Concrete	1911	1	2'0"x2'0"	20	1
Henefer.....	Main Canyon Slough.....	1911	Concrete	10	Concrete	20		Concrete	1911	11	1'0"x1'6"	18	11
Echo.....	†Echo Creek.....	1911	Concrete	12	Concrete	20		Cor. Iron	1912	2	10"	20	None
Coalville.....								Cor. Iron	1912	2	12"	18	None
Rockfort.....								Cem. Pipe	1912	1	12"	20	None
Peoa.....								Cem. Pipe	1912	1	20"	18	None
Oakley.....	†Weber River.....	1912	Steel	40	Concrete	16	\$1470.84	Concrete	1912	3	1'0"x2'0"	20	None
Marion.....								Concrete	1912	1	4'0"x5'0"	20	None
Kamas.....								Cem. Pipe	1911	1	20"	18	1
Snyderville.....								Cem. Pipe	1911	1	24"	24	1
								Cem. Pipe	1912	1	30"	24	1
								Cem. Pipe	1912	3	24"	20	2
								Cem. Pipe	1912	2	20"	24	2
								Cem. Pipe	1912	2	20"	24	3
								Cor. Iron	1912	1	12"	18	None
Park City.....								Cem. Pipe	1912	1	30"	24	None
								Cem. Pipe	1912	1	12"	18	None
								Concrete	1912	1	3'0"x3'0"	24	1

*Blasted through rock ledge.

†Abutments.

‡Does not include cost of wood floor, estimated at about \$60.00.

TOOELE COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Lake Point	6.00	1910 1911 1912	3.00 1.00 2.50	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....	Earth Earth Earth	36 36 36	3.00 1.00 2.50	14 14 14	10 10 10	Gravel Gravel Gravel	Yes Yes Yes
Erda	5.50	1910 1911 1912	4.50 1.00	..... .....	..... .....	..... .....	..... .....	Earth Earth	36 36	4.50 1.00	14 14	10 10	Gravel Gravel	Yes Yes
Tooele	8.00	1910 1911 1912	8.00	Earth	36	1.50	Yes	Earth	36	6.50	14	10	Gravel	Yes
Stockton	7.00	1910 1911 1912	1.00	.....	.....	.....	.....	Earth	36	1.00	14	10	Gravel	Yes
St. John and Clover	6.00	1910 1911 1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	32.50	.....	21.00	.....	.....	1.50	.....	.....	.....	19.50	.....	.....	.....	.....

TOOELE COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Lake Point.....								Cor. Iron	1910	1	14"	36	None
								Cor. Iron	1911	1	12"	36	None
Erda.....								Cor. Iron	1910	2	12"	36	None
								Concrete	1910	1	3'0"x1'6"	36	None
Tooele.....								Concrete	1911	2	6'0"x3'0"	25	2
								Cor. Iron	1912	1	12"	36	None
								Cor. Iron	1912	1	14"	36	None
								Cor. Iron	1912	1	16"	40	None
								Concrete	1912	1	3'0"x2'0"	36	None
								Concrete	1912	3	2'0"x1'0"	36	None
Stockton.....								Concrete	1912	1	2'6"x2'0"	40	None
								Concrete	1912	1	2'0"x1'0"	40	None

UINTAH COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	ROAD GRADED.				ROAD SURFACED.							
			Miles Constructed	Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
Davis	14.50	1910	2.65	Earth	25	2.65	No							
		1911	4.35	Earth	16	4.35	No							
		1912												
Naples	3.00	1910	3.00	Earth	16	3.00	No							
		1911												
		1912												
Glines	4.50	1910	3.00	Earth	16	3.00	No							
		1911												
		1912												
Vernal	3.00	1910	0.50	Earth	16	0.50	No							
		1911	2.00	Earth	16	2.00	No							
		1912												
Moffat	8.40	1910	4.00	Earth	16	4.00	No							
		1911	1.00	Earth	16	1.00	No							
		1912												
Jensen	25.00	1910	2.15	Earth	16	1.90	No	Earth	16	0.25	16	Gravel	No	
		1911	5.00	Earth	16	5.00	No							
		1912												
Alta	3.00	1910	1.50	Earth	16	1.50	No							
		1911	1.00	Earth	16	1.00	No							
		1912												
Dry Gulch	3.00	1910	2.00	Earth	16	2.00	No							
		1911												
		1912												
Total	64.40		32.15			31.90			0.25					

UINTAH COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.						CULVERTS.						
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Randlett....	Sleepy Hollow....	1911	Wood	14	Cribbing	16	\$ 70.00	Cor. Iron Rock	1912	4	16"	20	None
								Rock	1912	3	2'0" x 2'0"	25	None
								Rock	1912	3	2'0" x 3'0"	35	None
Glines.....	Upper Canal.....	1912	Wood	16	Stone	16	116.00	Cor. Iron	1912	1	12"	20	None
								Cor. Iron	1912	2	16"	20	None
Vernal.....	Ashton Lat.....	1912	Stone	3	Stone	35	135.00	Cor. Iron	1912	2	12"	22	None
	Bartlett Gulch...	1910	Wood	8	Stone	25	100.00	Cor. Iron	1912	2	12"	18	None
								Cor. Iron	1912	2	16"	22	None
Moffat.....	Slough Gulch....	1912	Wood	8	Stone	30	281.00	Cor. Iron	1912	2	12"	18	None
	Robbins' Gulch...	1912	Wood	5	Cribbing	25	37.50	Cor. Iron	1912	2	16"	22	None
Jensen.....	.....	.....	.....	.....	.....	.....	.....	Cor. Iron	1912	1	16"	18	None
								Cor. Iron	1912	2	12"	18	None

UTAH COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfac'd in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
				Kind of Material	Width in Feet	Length in Miles	Rolled							
Salem	4.50	1910	1.00	40	1.50	40	Earth	40	1.00	12	4	Gravel	No	
		1911	1.50	40	1.50	40	Earth	40	1.00	12	4	Gravel	No	
		1912	0.70	40	0.70	40	Gravel	40	0.70	12	4	Gravel	No	
Payson	3.50	1910	0.70	40	0.70	40	Earth	40	0.30	12	4	Gravel	No	
		1911	0.70	40	0.70	40	Earth	40	0.30	12	4	Gravel	No	
Spring Lake	3.00	1910	0.70	40	0.70	40	Earth	40	0.30	12	4	Gravel	No	
		1911	0.70	40	0.70	40	Earth	40	0.30	12	4	Gravel	No	
Santaquin	8.20	1910	3.40	40	2.50	40	Earth	40	0.90	12	4	Gravel	No	
		1911	1.80	40	1.00	40	Earth	40	0.80	12	4	Gravel	No	
Goshen	5.50	1910	3.40	40	3.00	40	Earth	40	0.40	12	4	Gravel	No	
		1911	3.40	40	3.00	40	Earth	40	0.40	12	4	Gravel	No	
Elberta	11.00	1910	3.30	40	3.30	40	Earth	40	0.40	12	4	Gravel	No	
		1911	3.30	40	3.30	40	Earth	40	0.40	12	4	Gravel	No	
Thistle, Clinton ..	25.50	1910	2.00	20	2.00	40	Gravel	40	1.00	12	4	Gravel	No	
		1911	3.00	40	2.00	40	Earth	40	0.50	12	4	Gravel	No	
Lehi	6.50	1911	1.50	40	1.00	40	Earth	40	0.50	12	4	Gravel	No	
		1912	1.50	40	1.00	40	Earth	40	0.50	12	4	Gravel	No	

UTAH COUNTY.—ROAD CONSTRUCTION—Continued.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled
American Fork ..	4.00	1910 1911 1912	1.00 2.00 1.00	Earth Earth Earth	40 40 40	1.00 2.00 1.00	No No No	Earth Earth Earth	40 40 40	1.50 1.00 1.50	12 12 12	4 4 4	Gravel Gravel Gravel	No No No
Pleasant Grove ..		1910 1911 1912	1.50 1.00 2.00	Earth Earth Earth	40 40 40	0.50	No	Earth Earth Earth	40 40 40	2.10 2.10	12 12	4 4	Gravel Gravel	No Yes
Provo Bench	4.20	1910 1911 1912	2.10 2.10	Earth Earth				Earth Earth	40 40	0.70 3.00 2.00 0.50	.2 12 12 12	4 16 4	Gravel Limestone Gravel Gravel	Yes Yes No No
Pleasant View ...	14.60	1910	3.70	Earth				Earth Macadam Earth Earth	40 40 40 40	1.50	12	4	Gravel	No
Springville	5.20	1910 1911 1912	1.50 1.00 0.80	Earth Earth Gravel	75 40	1.00 0.80	No No	Earth	40	1.70	12	4	Gravel	Yes
Spanish Fork ...	13.00	1910 1911 1912	2.20 4.80 1.10	Earth Earth	75 40	0.50 2.50	No No	Earth	40	1.10	12	4	Gravel	No
Tucker	20.00	1910 1911 1912												
Colton	17.00	1910 1911 1912												
Total	150.20		53.40			29.00				24.40				

UTAH COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

BRIDGES.										CULVERTS.				
Precinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls	
Lehi.....								Con. Arch	1910	3	20"	24	3	
								Con. Arch	1910	1	24"	24	1	
								Con. Arch	1910	1	30"	26	1	
								Con. Arch	1910	1	36"	36	1	
								Con. Arch	1911	1	36"	37	1	
								Cem. Pipe	1911	1	10"	38	1	
								Cem. Pipe	1911	1	12"	38	1	
								Cem. Pipe	1911	1	15"	40	1	
								Cem. Pipe	1911	3	20"	37	3	
								Cem. Pipe	1911	1	24"	42	1	
								Cem. Pipe	1912	1	12"	38	1	
								Cem. Pipe	1912	2	15"	34	2	
								Cem. Pipe	1912	1	18"	44	1	
								Cem. Pipe	1912	1	20"	46	1	
								Con. Arch	1912	2	72"	45	2	
American Fork.....								Cem. Pipe	1910	2	10"	34	2	
								Con. Arch	1910	6	24"	36	6	
								Cem. Pipe	1912	1	12"	38	1	
								Cem. Pipe	1912	1	15"	38	1	
								Cem. Pipe	1912	2	18"	49	2	
								Cem. Pipe	1912	1	20"	44	1	
								Cem. Pipe	1912	1	24"	40	1	
								Con. Arch	1912	1	24"	86	2	
							Con. Arch	1912	1	36"	38	1		

UTAH COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.—Continued.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Pleasant Grove.....								Cem. Pipe	1910	1	6"	28	1
								Cem. Pipe	1912	1	15"	42	1
								Concrete	1912	1	12" x 24"	60	1
								Con. Arch	1912	2	30"	84	2
								Con. Arch	1912	1	36"	35	1
Provo Bench.....								Con. Arch	1912	1	48"	38	1
								Con. Arch	1912	1	54"	38	1
								Cem. Pipe	1910	2	12"	36	2
Pleasant View.....								Cem. Pipe	1910	2	15"	37	2
								Cem. Pipe	1910	7	20"	38	7
								Cem. Pipe	1910	8	24"	42	8
								Cem. Pipe	1910	1	30"	42	1
								Con. Arch	1910	4	48"	38	4
								Cem. Pipe	1909	4	12"	34	4
								Cem. Pipe	1909	5	15"	39	5
								Cem. Pipe	1909	3	18"	40	3
								Cem. Pipe	1909	1	24"	51	1
								Con. Arch	1909	8	30"	40	8
							Con. Arch	1909	1	60"	22	1	
							Con. Arch	1909	1	84"	24	1	
							Cem. Pipe	1910	1	24"	40	1	
							Con. Arch	1910	1	48"	30	1	
							Cem. Pipe	1911	1	14"	50	1	
							Cem. Pipe	1911	1	20"	48	1	
							Con. Arch	1911	1	54"	50	1	

UTAH COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.—Continued.

BRIDGES.										CULVERTS.				
Preinct	Location	Year	Type	Span In Feet	Kind of Abutments	Width of Roadway In Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls	
Springville.	Cem. Pipe	1909	1	10"	28	1	
	Cem. Pipe	1909	1	12"	28	1	
	Cem. Pipe	1909	3	15"	34	3	
	Cem. Pipe	1910	1	12"	40	1	
	Cem. Pipe	1911	1	22"	42	1	
	Cem. Pipe	1911	1	12"	52	1	
	Cem. Pipe	1911	1	15"	44	1	
	Cem. Pipe	1911	1	20"	40	1	
Spanish Fork.....	Cem. Pipe	1909	7	12"	32	7	
	Cem. Pipe	1909	2	15"	31	2	
	Cem. Pipe	1909	1	18"	30	1	
	Cem. Pipe	1911	5	15"	35	5	
	Cem. Pipe	1911	1	20"	30	1	
	Cem. Pipe	1911	1	30"	24	1	
	Con. Arch	1911	1	48"	32	1	
	Con. Arch	1911	1	72"	48	1	
	Con. Arch	1911	1	84"	34	1	
	Con. Arch	1911	1	96"	30	1	
Salem.....	Cem. Pipe	1910	2	15"	30	2	
	Cem. Pipe	1911	1	12"	40	1	
	Cem. Pipe	1911	1	15"	36	1	
	Cem. Pipe	1911	1	18"	36	1	
	Cem. Pipe	1911	1	20"	40	1	

UTAH COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.—Continued.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Payson.....	Concrete	1909	1	7'0" x 9'0"	42	1
	Cem. Pipe	1910	3	12"	35	3
	Cem. Pipe	1910	2	15"	36	2
Spring Lake.....	Cem. Pipe	1911	2	12"	35	2
	Cem. Pipe	1911	1	18"	44	1
Santaquin.....	Cem. Pipe	1911	1	12"	46	1
	Cem. Pipe	1911	2	12"	34	None
	Cem. Pipe	1911	6	15"	34	None
	Cem. Pipe	1911	3	18"	27	2
	Cem. Pipe	1911	1	24"	24	1
	Con. Arch	1911	1	24"	24	1
								Con. Arch	1912	2	36"	40	None

NOTE—Size of all concrete arches are given by span only.

WASATCH COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.										
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled				
Charleston	15.00	1910 1911 1912																
Heber	8.00	1910 1911 1912																
Elkhorn	5.00	1910 1911 1912																
Riverdale	4.00	1910 1911 1912	1.50	Earth	20	1.50	No											
Daniels	17.06	1910 1911 1912	2.50 3.00 5.00	Earth Earth Earth	12 12 14	2.50 3.00 5.00	No No No											
Fruitland	35.00	1910 1911 1912	3.00 1.00	Earth Earth	16 14	3.00 1.00	No No											
Theodore	60.00	1910 1911 1912	12.00 4.00	Earth Earth	14 12	12.00 4.00	No No											
Myton	22.00	1910 1911 1912	4.00 3.00	Earth Earth	16 16	4.00 3.00	No No											
Roosevelt	7.00	1910 1911 1912	3.00 2.00	Earth Earth	20 20	3.00 2.00	No No											
Total	173.00		44.00			44.00												

NOTE—About 50 per cent of the above has been dugway work.

WASATCH COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Heber.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Elkhorn.....	Spring Creek.....	1911	Wood	12	Cribbing	12	.....	Cor. Iron	1912	4	24"	14	4
	Provo River.....	1912	Steel	52	Concrete	14	.....	Cor. Iron	1912	2	24"	14	1
Dantels.....	Dantels Creek.....	1910	Wood	16	Cribbing	14	.....					
	Dantels Creek.....	1911	Wood	16	Cribbing	14	.....					
	Dantels Creek.....	1912	Wood	16	Cribbing	14	.....					
Fruitland...	Strawberry River	1911	Wood	20	Cribbing	14	.....					
	Deep Creek.....	1912	Wood	12	Cribbing	14	.....					
Theodore...	Strawberry.....	1910	Wood	98	Cribbing	14	.....					
	Strawberry.....	1912	Wood	48	Cribbing	14	.....					
	Willow Creek.....	1911	Wood	10	Cribbing	14	.....					
	Willow Creek.....	1912	Wood	16	Cribbing	14	.....					
	Gray Mtn.....	1912	Wood	12	Cribbing	14	.....					
Myton.....	Gray Mtn.....	1911	Wood	12	Cribbing	14	.....	Cor. Iron	1911	4	24"	14	4
	Gray Mtn.....	1912	Wood	12	Cribbing	14	.....					
	New Hope.....	1911	Wood	16	Cribbing	14	.....					
	New Hope.....	1912	Wood	16	Cribbing	14	.....					
Roosevelt...	South Fork— Dry Gulch.....	1911	Wood	18	Cribbing	14	.....					
	North Fork— Dry Gulch.....	1912	Wood	48	Stone and Concrete	14	\$2508.14						
	Dry Gulch.....	1912	Wood	16	Cribbing	14	.....					

WASHINGTON COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.							
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	Rolled	
Harmony	5.00	1910	4.16	Earth	20	4.16	No								
		1911		Clay	20	1.30	No								
		1912													
St. George	2.50	1910	2.04	Clay	20	0.60	No	Sand	20	1.44	12	8	Clay	No	
		1911													
		1912													
Washington	6.50	1910	1.86	Clay	20	0.40	No	Sand	20	1.46	12	8	Clay	No	
		1911													
		1912													
Toquerville	18.00	1910	0.78	Earth	30	0.39	No								
		1911		Gravel	30	0.39	No								
		1912													
Leeds	9.00	1910	10.14							2.90					
		1911													
		1912													
						7.24									

WASHINGTON COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Harmony...	Dry Wash.....	1910	Wood	8	Timber	16	.....	Wood	1910	8	2'0"x2'0"	16	8
	Dry Wash.....	1910	Wood	6	Timber	16	.....	Wood	1910	3	2'6"x3'0"	16	3
St. George..	Cor. Iron	1912	2	36"	20	2
	Cor. Iron	1912	2	24"	22	2
	Cor. Iron	1912	1	20"	20	1
	Rock	1912	1	4'0"x3'0"	30	None
	Rock	1912	1	3'6"x2'0"	25	None
	Rock	1912	1	3'0"x2'6"	28	None
Washington	Rock	1912	1	3'6"x3'0"	22	None
	Rock	1912	1	3'0"x1'0"	20	None
	Rock	1912	1	2'0"x2'0"	21	None
	Rock	1912	1	2'0"x1'6"	38	None
	Rock	1912	2	2'0"x2'0"	24	None
	Rock	1912	1	3'6"x2'0"	24	None
.....	Rock	1912	1	3'6"x3'0"	30	None	
.....	Rock	1912	1	2'6"x1'0"	19	None

WAYNE COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

BRIDGES.										CULVERTS.				
Precinct	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls	
Loa.....	Spring Creek.....	1911	Wood	10	Stone	16	\$ 70.00	Cor. Iron	1911	11	10"	16	None	
	W. Ditch.....	1911	Wood	4	Stone	16	42.00	Cor. Iron	1911	1	12"	16	None	
								Cor. Iron	1911	1	24"	16	None	
Lyman.....	Canal.....	1912	Wood	10	Cribbing	16	50.00	Cor. Iron	1911	4	10"	16	None	
	Canal.....	1912	Wood	10	Cribbing	16	50.00	Cor. Iron	1912	1	30"	16	None	
Torrey.....	Sand Creek.....	1911	Wood	30	Stone	16	300.00							
Notom.....	Pleasant Creek.....	1911	Wood	20	Stone	16	250.00							
Calneville...	Fremont River...	1911	Wood	60	Cribbing	16	1100.00							
	Washout.....	1911	Wood	10	Cribbing	16	25.00							
	Washout.....	1911	Wood	10	Cribbing	16	25.00							
Hanksville.	D. D. River.....	1911	Wood and Steel	40	Cribbing, Stone	18	2300.00							
Fruita.....	Fremont River...	1909	Wood	30	Cribbing	16	300.00							
Thurber.....	Fremont River...	1909	Wood	30	Cribbing	16	420.00	Cor. Iron	1912	2	10"	18	2	
								Cor. Iron	1912	1	18"	16	1	
Teasdale....	Torrey Canal.....	1912	Wood	10	Rock	16	.....	Rock	1912	2	2'0"x2'0"	22	2

WEBER COUNTY.—ROAD CONSTRUCTION.

Precinct	Miles of State Road	Year	Miles Constructed	ROAD GRADED.				ROAD SURFACED.						Rolled
				Kind of Material	Width in Feet	Length in Miles	Rolled	Kind of Road	Width of Road in Ft.	Length of Road in Miles	Width Surfaced in Feet	Depth in Inches	Kind of Surfacing Material	
Eden	7.50	1910	1.40	.....	.....	.....	.....	Macadam	36	1.40	12	8	Limestone	Yes
		1911	1.16	.....	.....	.....	.....	Macadam	36	1.16	12	8	Limestone	Yes
		1912								
Huntsville	7.25	1910	1.00	.....	.....	.....	.....	Macadam	36	1.00	12	8	Limestone	Yes
		1912	0.56	.....	.....	.....	.....	Macadam	36	0.56	12	8	Limestone	Yes
Riverdale	3.50	1910	2.70	.....	33	1.60	Yes	Sand	36	1.10	33	12	Clay	Yes
		1911	1.10	.....	.....	.....	.....	Macadam	36	1.10	16	10	Limestone	Yes
		1912	1.10	.....	.....	.....	.....	Macadam	36	1.10	16	10	Limestone	Yes
Wilson	2.00	1910		.....	.....	.....	.....			
		1911		.....	.....	.....	.....			
		1912	1.90	.....	.....	.....	.....	Macadam	36	1.90	14	8	Limestone	Yes
North Ogden	3.50	1910		.....	.....	.....	.....			
		1911		.....	.....	.....	.....			
		1912	1.00	.....	.....	.....	.....	Earth	36	1.00	30	8	Gravel	Yes
Pleasant View	3.50	1910		.....	.....	.....	.....			
		1912	1.00	.....	.....	.....	.....	Macadam	36	1.00	20	10	Limestone	Yes
Burch Creek	1.00	1910		.....	.....	.....	.....			
		1912		.....	.....	.....	.....	Macadam	36	1.00	20	10	Limestone	Yes
Roy	2.00	1910		.....	.....	.....	.....			
		1911		.....	.....	.....	.....			
		1912		.....	.....	.....	.....			

WEBER COUNTY.—BRIDGE AND CULVERT CONSTRUCTION.

Precinct	BRIDGES.							CULVERTS.					
	Location	Year	Type	Span in Feet	Kind of Abutments	Width of Roadway in Feet	Cost	Type	Year	Number	Size	Average Length in Feet	No. with Headwalls
Eden.....	Irr. Canal.....	1911	Concrete	8	Concrete	18							
	Irr. Canal.....	1911	Concrete	8	Concrete	18							
	Irr. Canal.....	1911	Concrete	20	Concrete	30							
Riverdale...	Irr. Canal.....	1912	Concrete	10	Concrete	30					8"	40	None
	Irr. Canal.....	1912	Concrete	10	Concrete	30					15"	40	None
	Irr. Canal.....	1912	Concrete	10	Concrete	60					18"	30	None
Wilson.....										5			5

SUMMARY TABLE SHOWING ROAD CONSTRUCTION AND COST PER MILE FOR EACH COUNTY.

County	Miles of State Roads	Year	ROADS.						CULVERTS.						BRIDGES.				Total Expenditures	Average Cost Per Mile								
			Miles of Graded Roads	Miles of Surfaced Gravel Roads	Miles of Macadam Roads	Miles of Sand-Clay or Clay-Sand Roads	Miles of Concrete Roads	Totals	Number of Wood Culverts	Number of Cor. Iron Culverts	Number of Cement Pipe Culverts	Number of Concrete Culverts	Number of Rock Culverts	Total	Number of Wood Bridges	Number of Steel Bridges	Number of Concrete Bridges	Total										
Beaver	60.31	1909-10 1911-12	6.67 21.92	2.09	.....	.....	.....	.....	6.67 24.01	6	48	1	3	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	\$ 2,613.00	\$ 392.00	
Box Elder	171.00	1909-10 1911-12	2.70 13.40	2.00	0.75 2.25	.....	1.20	.....	3.45 18.85	1	1	.....	4	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	1,525.25	442.00
Cache	32.98	1909-10 1911-12	1.45	2.22 7.29	.....	.....	.....	.....	2.22 8.74	3	3	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	6,050.65	2,728.00
Carbon	63.80	1909-10 1911-12	3.30 18.00	.....	.....	.....	.....	.....	3.30 18.00	72	72	.....	.....	.....	.....	.....	.....	72	.....	.....	.....	.....	.....	.....	.....	.....	3,372.00	1,022.00
Davis	34.12	1909-10 1911-12	15.22	2.25 1.66	.....	1.18	.....	.....	2.25 18.06	71	71	89	5	.....	.....	.....	.....	165	.....	.....	.....	.....	.....	.....	.....	.....	4,000.00	1,778.00
Emery	115.11	1909-10 1911-12	16.00 27.75	.....	.....	.....	.....	.....	16.00 27.75	61	61	.....	.....	.....	.....	.....	.....	61	.....	.....	.....	.....	.....	.....	.....	.....	2,650.15	168.00
Garfield	54.00	1909-10 1911-12	2.15 6.50	.....	.....	.....	.....	.....	2.15 6.50	.....	.....	.....	4	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	3,569.74	1,660.00
Grand	107.75	1909-10 1911-12	6.25 10.38	2.50	.....	1.12	.....	.....	6.25 14.00	.....	.....	.....	.....	.....	.....	.....	.....	19	.....	.....	.....	.....	.....	.....	.....	.....	1,063.68	170.00
.....	120.40	1909-10 1911-12	6.00 14.00	.....	.....	1.60	.....	.....	6.00 15.00	7	7	.....	24	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2,550.29	425.00
.....	57.50	1909-10 1911-12	2.50 6.25	0.75 17.00	.....	.....	.....	.....	2.50 23.25	4	4	32	3	.....	.....	.....	.....	39	.....	.....	.....	.....	.....	.....	.....	.....	2,643.30	697.00
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	53	53	6	.....	.....	.....	.....	.....	64	.....	.....	.....	.....	.....	.....	.....	.....	29,386.99	1,251.00

*Includes cost of two sprinkling systems.

*Includes cost of two abutments.

TABLE SHOWING ROAD CONSTRUCTION AND COST PER MILE FOR EACH COUNTY—Continued.

County	Miles of State Roads	Year	ROADS							CULVERTS							BRIDGES				Total Expenditures	Average Cost Per Mile
			Miles of Graded Roads	Miles of Surfaced Gravel Roads	Miles of Macadam Roads	Miles of Sand-Clay or Clay Roads	Miles of Concrete Roads	Totals	Number of Wood Culverts	Number of Cor. Iron Culverts	Number of Cement Pipe Culverts	Number of Concrete Culverts	Number of Rock Culverts	Total	Number of Wood Bridges	Number of Steel Bridges	Number of Concrete Bridges	Total				
																			ROADS				CULVERTS			BRIDGES
Kane	102.50	1909-10 1911-12	9.60	.....	.....	3.00	.....	9.60	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,066.44	685.00
Millard	94.50	1909-10 1911-12	13.75 26.50	.....	.....	2.00	.....	13.75 28.50	7 36	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,846.30 11,548.91	297.00 405.00
Morgan	26.19	1909-10 1911-12	0.46	.....	2.53	.....	.....	0.70 5.03	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,677.49 18,549.17	5,253.00 3,687.00
Piute	25.09	1909-10 1911-12	5.00 15.17	.....	.....	.....	.....	5.00 15.17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,500.00 12,148.56	500.00 801.00
Rich	52.13	1909-10 1911-12	2.25 4.44	3.50 10.16	.....	.....	.....	5.75 14.60	6 47	.....	.....	.....	.....	.....	.....	.....	.....	.....	9,491.09 17,835.04	955.00 1,221.00
Salt Lake	46.00	1909-10 1911-12	0.88	1.00	.....	.....	.....	0.57 3.05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,179.59 8,510.93	7,333.00 2,790.00
San Juan	134.00	1909-10 1911-12	9.50	.....	.....	.....	.....	9.50	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	275.71 13,133.82	1,382.00
San Pete	94.85	1909-10 1911-12	5.75 37.20	0.30 0.10	.....	1.30 0.95	.....	7.35 38.25	15 93	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,020.89 25,422.57	547.00 665.00
Sevier	146.00	1909-10 1911-12	5.10 19.95	1.51 6.24	.....	.....	.....	6.61 26.19	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,944.14 24,163.67	446.00 322.00
Summit	101.00	1909-10 1911-12	1.25 13.93	5.59	.....	.....	.....	1.25 19.52	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,503.36 46,609.85	2,802.00 2,387.00

SUMMARY TABLE SHOWING ROAD CONSTRUCTION AND COST PER MILE FOR EACH COUNTY—Continued.

County	Miles of State Roads	Year	ROADS.						CULVERTS.						BRIDGES.				Total Expenditures	Average Cost Per Mile	
			Miles of Graded Roads	Miles of Surfaced Gravel Roads	Miles of Macadam Roads	Miles of Sand-Clay or Clay-Sand Roads	Miles of Concrete Roads	Totals	Number of Wood Culverts	Number of Cor. Iron Culverts	Number of Cement Pipe Culverts	Number of Concrete Culverts	Number of Rock Culverts	Total	Number of Wood Bridges	Number of Steel Bridges	Number of Concrete Bridges	Total			
Tooele	32.50	1909-10 1911-12	1.50	7.50					7.50	3	1		4						4	\$ 4,825.22	\$ 648.00
Uintah	64.40	1909-10 1911-12	25.90	6.00				13.50	16	8		12							12	16,205.23	1,200.00
Utah	150.20	1909-10 1911-12	25.50	8.50	3.00			26.15				22							22	2,113.58	352.00
Wasatch	173.00	1909-10 1911-12	2.50	12.90				15.00		29		89							89	14,674.33	561.00
Washington	45.00	1909-10 1911-12	4.16					38.40		54		76							76	3,957.88	264.00
Wayne	87.50	1909-10 1911-12	18.21					2.50				10							10	35,311.02	919.00
Weber	41.00	1909-10 1911-12	1.60					41.50				12							12	3,845.84	1,538.00
	2232.83	1909-10 1911-12	387.78	26.77	4.32	2.90		4.16	5			17							17	17,994.20	434.00
			86.43	16.14	9.75		5.98	20.33	21			23							23	2,581.79	620.00
								11.22				5							5	10,385.23	1,737.00
								133.38				19							19	787.80	695.00
								501.25				7							7	14,122.85	
												7							7	4,340.29	1,611.00
												2							2	32,838.21	2,927.00
												2							2	883,606.03	\$ 627.00
												20							20	570,009.40	1,137.00

—The total expenditures are according to the records of this office, and include all unpaid bills incurred up to December 1, 1912.

**TABLE SHOWING SPECIAL ROAD TAX LEVY BY COUNTIES
1911-1912.**

County	Precincts	SPECIAL ROAD TAX LEVY			Total Receipts from Tax Levy to Date
		1910	1911	1912	
Beaver.....	Beaver		5 mill	5 mill	
	Adamsville		5 mill	5 mill	
	Greenville		5 mill	5 mill	
	Minersville		5 mill	5 mill	
	Milford		5 mill	5 mill	
	Receipts from levy		\$7,862.56	\$8,550.63	\$16,413.19
Box Elder.	Willard	5 mill			
	Brigham		5 mill		
	Perry	5 mill			
	Mantua		5 mill		
	Malad or Fielding.			5 mill	
	Bear River.....				
	Elwood				
	Tremonton		5 mill		
	Rawlins			5 mill	
	Plymouth				
	Riverside		5 mill		
	Portage				
	Howell or Blue Creek			5 mill	
	Garland		5 mill		
	Curlew			5 mill	
Park Valley			5 mill		
Lucin.....			5 mill		
Kelton			5 mill		
Rosette			5 mill		
Receipts from levy.	\$3,045.67	12,101.64	18,137.32	33,284.63	
Cache.....	Greenville		5 mill		
	Hyde Park.....		5 mill		
	Wellsville	5 mill			
	College	5 mill			
	Providence	5 mill			
	Richmond			5 mill	
	Smithfield		5 mill		
	Mt. Sterling..... Cove or Mt. Home			5 mill	
Receipts from levy.	5,777.60	4,274.46	3,239.42	13,291.48	

TABLE SHOWING SPECIAL ROAD TAX LEVY BY COUNTIES
1911-1912.

County	Precincts	SPECIAL ROAD TAX LEVY			Total Receipts from Tax Levy to Date
		1910	1911	1912	
Carbon.....	Castlegate		5 mill		
	Kenilworth				
	Helper		5 mill		
	Spring Glen		5 mill		
	Carbonville		5 mill		
	Price		5 mill		
	Wellington		5 mill		
	Sunnyside				
	Hiawatha				
		Receipts from levy.		\$ 9,663.04		$ 9,663.04
Davis.....	South Bountiful...		5 mill	3 mill	
	East Bountiful....		5 mill	3 mill	
	Centerville		5 mill	3 mill	
	Farmington		5 mill	3 mill	
	Kaysville-Layton..		5 mill	3 mill	
	16th Precinct		5 mill	3 mill	
	Clearfield		5 mill	3 mill	
	Clinton		5 mill	3 mill	
	South Weber.....			3 mill	
		Receipts from levy.		25,249.42	18,329.19	43,578.61
Emery.....	Elmo		5 mill	3 mill	
	Cleveland		5 mill	3 mill	
	Huntington		5 mill	3 mill	
	Castle Dale		5 mill	3 mill	
	Orangeville		5 mill	3 mill	
	Clawson		5 mill	3 mill	
	Ferron		5 mill	3 mill	
	Emery		5 mill	3 mill	
	Green River			3 mill	
	Woodside			3 mill	
	Receipts from levy.		3,917.48	7,015	96
Garfield....	Bear Creek		1 mill	5	
	Panguitch		1 mill		
	Hillsdale			5	
		Receipts from levy.		356.53	

**TABLE SHOWING SPECIAL ROAD TAX LEVY BY COUNTIES
1911-1912.**

County	Precincts	SPECIAL ROAD TAX LEVY			Total Receipts from Tax Levy to Date
		1910	1911	1912	
Grand.....	No. 1.....		5 mill	5 mill	
	No. 2.....		5 mill	5 mill	
	No. 3.....			5 mill	
	Receipts from levy.		\$4,808.10	\$ 5,472.06	\$10,280.16
Iron.....	Paragoonah			5 mill	
	Parowan		2 mill		
	Summit		2 mill	5 mill	
	Enoch			5 mill	
	Cedar		2 mill	5 mill	
	Kanarra		2 mill	5 mill	
	Receipts from levy.		3,791.41	10,489.93	14,281.34
Juab.....	Nephi		5 mill		
	Mona		5 mill		
	Levan			5 mill	
	Eureka				
	Receipts from levy.		9,199.20	3,430.21	12,629.41
Kane.....	Kanab		5 mill	5 mill	
	Johnson		5 mill	5 mill	
	Alton		5 mill	5 mill	
	Glendale			5 mill	
	Orderville			5 mill	
	Mount Carmel			5 mill	
	Receipts from levy.		1,263.71	2,923.34	4,187.05
Millard....	Hinckley				
	Oasis		5 mill		
	Deseret		5 mill		
	Holden		5 mill		
	Fillmore		5 mill		
	Kanosh				
	Hatton				
	Meadow				
	Scipio				
Receipts from levy.		3,782.29		3,782.29	

**TABLE SHOWING SPECIAL ROAD TAX LEVY BY COUNTIES
1911-1912.**

County	Precincts	SPECIAL ROAD TAX LEVY			Total Receipts from Tax Levy to Date
		1910	1911	1912	
Morgan....	Peterson	5 mill		5 mill	
	Milton			5 mill	
	Morgan		5 mill	5 mill	
	Croydon		5 mill	5 mill	
	Receipts from levy.	\$ 1,012.00	\$ 4,322.04	\$ 4,409.84	\$ 9,743.88
Piute.....	Greenwich				
	Circleville		2 mill	5 mill	
	Junction		2 mill	5 mill	
	Marysvale		2 mill	5 mill	
	Bullion			5 mill	
Receipts from levy.		918.82	2,159.98	3,078.80	
Rich.....	Woodruff	5 mill		5 mill	
	Argyle		5 mill	5 mill	
	Randolph	5 mill		5 mill	
	Lake Town		5 mill	5 mill	
	Garden City		5 mill	5 mill	
Receipts from levy.	3,724.69	1,981.62	6,419.18	12,125.49	
Salt Lake..	No. 2.....				
	No. 3.....				
	No. 4.....				
	No. 5.....				
	No. 6.....				
	No. 7.....				
	No. 8.....				
	No. 9.....				
	No. 11				
	Receipts from levy.				
San Juan..	Bluff		5 mill	5 mill	
	Grayson		5 mill	5 mill	
	Monticello		5 mill	5 mill	
	La Sal		5 mill	5 mill	
	Receipts from levy.		2,906.27	2,948.33	5,854.60

TABLE SHOWING SPECIAL ROAD TAX LEVY BY COUNTIES
1911-1912.

County	Precincts	SPECIAL ROAD TAX LEVY			Total Receipts from Tax Levy to Date
		1910	1911	1912	
Sanpete....	Gunnison			5 mill	
	Sterling		5 mill	5 mill	
	Manti			5 mill	
	Ephraim			5 mill	
	Chester			5 mill	
	Meadowville			5 mill	
	Moroni			5 mill	
	Fountain Green ...			5 mill	
	Spring City			5 mill	
	Mount Pleasant ..			5 mill	
	Pleasant View			5 mill	
	Fairview			5 mill	
	Milburn			5 mill	
	Indianola			5 mill	
	Receipts from levy.		\$ 687.59	\$24,357.36	\$25,044.95
Sevier.....	Remond		5 mill	5 mill	
	Salina		5 mill	5 mill	
	Aurora		5 mill	5 mill	
	Vermillion		5 mill	5 mill	
	Sigurd		5 mill	5 mill	
	Venice		5 mill	5 mill	
	Richfield		5 mill	5 mill	
	Central		5 mill	5 mill	
	Elsinore		5 mill	5 mill	
	Cove		5 mill	5 mill	
	Glenwood		5 mill	5 mill	
	Joseph		5 mill	5 mill	
	Monroe			5 mill	
	Burrville		5 mill	5 mill	
Koosharem		5 mill	5 mill		
	Receipts from levy.		12,834.84	15,779.45	28,614.29
Summit....	Hoytsville		5 mill	5 mill	
	Henefer		5 mill	5 mill	
	Echo		5 mill	5 mill	
	Coalville		5 mill	5 mill	
	Wanship		5 mill	5 mill	
	Rockport		5 mill	5 mill	

**TABLE SHOWING SPECIAL ROAD TAX LEVY BY COUNTIES
1911-1912.**

County	Precincts	SPECIAL ROAD TAX LEVY			Total Receipts from Tax Levy to Date
		1910	1911	1912	
Summit.... Cont'd.	Peoa		5 mill	5 mill	
	Oakley		5 mill	5 mill	
	Marion		5 mill	5 mill	
	Kamas		5 mill	5 mill	
	Snyderville			5 mill	
	Park City			5 mill	
	Castle Rock			5 mill	
	Receipts from levy.		\$19,288.51	\$24,286.85	\$43,575.36
Tooele....	Lake Point	5 mill		5 mill	
	Erda	5 mill			
	Tooele		5 mill		
	Stockton		5 mill	5 mill	
	St. John			5 mill	
	Clover			5 mill	
	Receipts from levy.	3,905.07	10,521.13	4,827.51	19,253.71
Uintah....	Davis		2½ mill	2½ mill	
	Naples		2½ mill	2½ mill	
	Glines		2½ mill	2½ mill	
	Vernal		2½ mill	2½ mill	
	Moffat		2½ mill	2½ mill	
	Jensen		2½ mill	2½ mill	
	Alta		2½ mill	2½ mill	
	Dry Gulch		2½ mill	2½ mill	
	Receipts from levy.		2,073.92	2,248.68	4,322 60
Utah.....	Lehi				
	American Fork ...				
	Pleasant Grove ...				
	Provo Bench				
	Pleasant View				
	Springville				
	Spanish Fork				
	Salem				
	Payson				
Spring Lake					
Santaquin			5 mill		

**TABLE SHOWING SPECIAL ROAD TAX LEVY BY COUNTIES
1911-1912.**

County	Precincts	SPECIAL ROAD TAX LEVY			Total Receipts from Tax Levy to Date
		1910	1911	1912	
Utah..... Cont'd.	Goshen			5 mill	
	Elberta				
	Thistle			5 mill	
	Tucker			5 mill	
	Colton			5 mill	
	*Clinton.....			5 mill	
	Receipts from levy.			\$13,383.22	\$13,383.22
Wasatch...	Charleston				
	Heber				
	Elkhorn			5 mill	
	Riverdale			5 mill	
	Daniels		5 mill		
	Fruitland		5 mill		
	Theodore		5 mill	5 mill	
	Myton			5 mill	
	Roosevelt			5 mill	
Receipts from levy.		936.57	3,330.26	4,266.83	
Washington	Harmony		5 mill		
	St. George			5 mill	
	Washington			5 mill	
	Toquerville		5 mill	5 mill	
	La Verkin			5 mill	
	Leeds			5 mill	
	Hurricane			5 mill	
	Receipts from levy.		539.06	3,225.00	3,764.06
Wayne.....	Fremont		5 mill	5 mill	
	Loa		5 mill	5 mill	
	Thurber		5 mill	5 mill	
	Lyman		5 mill	5 mill	
	Teasdale		5 mill	5 mill	
	Torrey		5 mill	5 mill	
	Notom		5 mill	5 mill	
	Caineville		5 mill	5 mill	
	Hanksville		5 mill	5 mill	
	Fruita		5 mill	5 mill	
	Giles		5 mill	5 mill	
	Receipts from levy.		1,560.83	1,593.44	3,154.27

1 the Thistle Road Precinct.

**TABLE SHOWING SPECIAL ROAD TAX LEVY BY COUNTIES
1911-1912.**

County	Precincts	SPECIAL ROAD TAX LEVY			Total Receipts from Tax Levy to Date
		1910	1911	1912	
Weber.....	Eden		5 mill		
	Huntsville		5 mill	5 mill	
	Riverdale		5 mill		
	Wilson		5 mill		
	North Ogden		5 mill		
	Pleasant View		5 mill	5 mill	
	Birch Creek				
	Roy				
	Garland				
	West Weber				
Warren					
	Receipts from levy.		\$10,353.88	\$ 3,820.53	\$14,174.41
Totals.....		\$17,465.03	\$155,194.92	\$190,720.46	\$363,380.41

NOTE.—Receipts from levy for 1910 and 1911 are amounts collected to December, 1912; for 1912 are estimated amounts.

**TABLES SHOWING APPROPRIATIONS AND EX-
PENDITURES BY COUNTIES**

1911-1912

BEAVER COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00	
1909 and 1910.....	\$ 1,000.00	
1911 Bond Issue.....	10,000.00	\$16,444.44

County Appropriations—

1909 and 1910.....	\$ 1,000.00	
1911 and 1912.....	2,000.00	
1911 Special Road Tax (amount reported collected)	7,862.56	
1912 Special Road Tax (based on valuation)	8,550.63	19,413.19
		\$35,857.63

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,999.71	
1911 and 1912.....	13,321.63	\$15,321.34

By County Auditor—

1909 and 1910.....	\$ 613.29	
1911 and 1912.....	8,648.14	9,261.43

Unpaid Labor	2,406.31	
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Unpaid Purchases	1,040.60	28,029.68
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December 1, 1912, Balance.....		\$ 7,827.95
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BOX ELDER COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00	\$16,444.44	

County Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,000.00		
1910 Special Road Tax (amount reported collected)	3,045.67		
1911 Special Road Tax (amount reported collected)	12,101.64		
1912 Special Road Tax (based on valuation)	18,137.32	39,284.63	\$55,729.07

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,525.25		
1911 and 1912.....	13,766.31	\$15,291.56	

By County Auditor—

1909 and 1910.....			
1911 and 1912.....	\$14,684.60	14,684.60	

Unpaid Labor		3,109.25	
Unpaid Purchases		3,086.89	36,172.30

December 1, 1912, Balance.....			\$19,556.77
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CACHE COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00		\$16,444.44

County Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,000.00		
1910 Special Road Tax (amount reported collected)	5,777.60		
1911 Special Road Tax (amount reported collected)	4,274.46		
1912 Special Road Tax (based on valuation)	3,239.42	19,291.48	\$35,735.92

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,999.73		
1911 and 1912.....	10,933.01		\$12,932.74

By County Auditor—

1909 and 1910.....	\$ 4,050.92		
1911 and 1912.....	6,560.91	10,611.83	

Unpaid Labor		2,885.94	
Unpaid Purchases		650.43	27,080.94

December 1, 1912, Balance..... \$ 8,654.98

CARBON COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00	\$16,444.44	
		<u> </u>	

County Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,000.00		
1911 Special Road Tax (re- ported)	9,663.04	15,663.04	\$32,107.48
		<u> </u>	<u> </u>

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	13,335.56	\$15,335.56	
		<u> </u>	

By County Auditor—

1909 and 1910.....	\$ 1,372.00		
1911 and 1912.....	8,953.18	10,325.18	
		<u> </u>	

Unpaid Purchases		237.00	25,897.74
		<u> </u>	<u> </u>

December 1, 1912, Balance.....			\$ 6,209.74
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DAVIS COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	4,444.45	
1911 Bond Issue.....	10,000.00	\$16,444.45

County Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,000.00		
1911 Special Road Tax (amount reported collected)	25,249.42		
1912 Special Road Tax (based on valuation)	18,329.19	49,578.61	\$66,023.06

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	13,463.98	\$15,463.98

By County Auditor—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	27,971.08	29,971.08

Unpaid Labor	2,839.95	
Unpaid Purchases	1,501.83	49,776.84

December 1, 1912, Balance.....		\$16,246.22
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EMERY COUNTY.**Receipts.****State Appropriations—**

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00	\$16,444.44	

County Appropriations—

1909 and 1910.....	\$ 1,000.00		
1911 and 1912.....	2,000.00		
1911 Special Road Tax (amount reported collected)	3,917.48		
1912 Special Road Tax (based on valuation)	7,015.48	13,932.96	\$30,377.40

Disbursements.**By State Auditor—**

1909 and 1910.....	\$ 1,807.69		
1911 and 1912.....	13,917.38	\$15,725.07	

By County Auditor—

1909 and 1910.....	\$ 842.46		
1911 and 1912.....	6,630.08	7,472.54	

Unpaid Labor	624.90		
Unpaid Purchases.....	442.40	24,264.91	

December 1, 1912, Balance.....		\$ 6,112.49	
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GARFIELD COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	<u>10,000.00</u>	\$16,444.44	

County Appropriations—

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,037.45		
1911 Special Road Tax (amount reported collected)	356.53		
1912 Special Road Tax (based on valuation)	<u>343.25</u>	<u>2,237.23</u>	\$18,681.67

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 2,970.31		
1911 and 1912.....	<u>7,799.33</u>	\$10,769.64	

By County Auditor—

1909 and 1910.....	\$ 599.43		
1911 and 1912.....	<u>939.00</u>	1,538.43	

Unpaid Labor		2,502.56	
Unpaid Purchases		<u>502.43</u>	<u>15,313.06</u>

December 1, 1912, Balance.....			\$ 3,368.61
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GRAND COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	4,444.44	
1911 Bond Issue.....	<u>10,000.00</u>	\$16,444.44

County Appropriations—

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,000.00		
1911 Special Road Tax (amount reported collected)	4,808.10		
1912 Special Road Tax (based on valuation)	<u>5,472.06</u>	<u>11,780.16</u>	\$28,224.60

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 973.33	
1911 and 1912.....	<u>9,879.06</u>	\$10,852.39

By County Auditor—

1909 and 1910.....	\$ 90.35	
1911 and 1912.....	<u>4,946.72</u>	5,037.07

Unpaid Labor.....		199.75
Unpaid Purchases.....		<u>369.16</u>
		\$16,458.37

December 1, 1912, Balance.....\$11,766.23

IRON COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00	\$16,444.44	

County Appropriations—

1910 and 1911.....	\$ 1,000.00		
1911 and 1912.....	2,111.11		
1911 Special Road Tax (amount reported collected).....	3,791.41		
1912 Special Road Tax (based on valuation).....	10,489.93	17,392.45	\$33,836.89

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,943.79		
1911 and 1912.....	7,221.66	\$ 9,165.45	

By County Auditor—

1909 and 1910.....	\$ 606.50		
1911 and 1912.....	4,180.94	4,787.44	
Unpaid Labor.....		1,811.00	
Unpaid Purchases.....		535.95	16,299.84

December 1, 1912, Balance.....			\$17,537.05
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JUAB COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	4,444.44	
1911 Bond Issue.....	10,000.00	\$16,444.44

County Appropriations—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	4,151.95	
1910 Special Road Tax (amount reported collected).....	9,199.20	
1912 Special Road Tax (based on valuation)	3,430.21	18,781.36
		\$35,225.80

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,033.20	
1911 and 1912.....	14,790.59	\$15,823.79

By County Auditor—

1909 and 1910.....	\$ 1,231.10	
1911 and 1912.....	13,823.03	15,054.13
Unpaid Labor.....		180.50
Unpaid Purchases.....		592.87
		\$31,651.29

December 1, 1912, Balance.....		\$ 3,574.51
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KANE COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00	<u>\$16,444.44</u>	

County Appropriations—

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,000.00		
1911 Special Road Tax (amount reported collected).....	1,263.71		
1912 Special Road Tax (based on valuation).....	2,923.34	<u>5,687.05</u>	<u>\$22,131.49</u>

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,966.44		
1911 and 1912.....	5,928.93	<u>\$ 7,895.37</u>	

By County Auditor—

1909 and 1910.....	\$ 90.00		
1911 and 1912.....	918.07	<u>1,008.07</u>	
Unpaid Labor.....		1,777.93	
Unpaid Purchases.....		644.61	<u>11,325.98</u>

December 1, 1912, Balance.....			<u>\$10,805.51</u>
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MILLARD COUNTY .**Receipts.****State Appropriations—**

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00	<u>\$16,444.44</u>	

County Appropriations—

1910 and 1910.....	\$ 1,000.00		
1911 and 1912.....	2,000.00		
1911 Special Road Tax (amount reported collected).....	3,782.29	<u>6,782.29</u>	<u>\$23,226.73</u>

Disbursements.**By State Auditor—**

1909 and 1910.....	\$ 1,846.30		
1911 and 1912.....	6,415.57	<u>\$ 8,261.87</u>	

By County Auditor—

1910 and 1910.....	\$ 1,000.00		
1911 and 1912.....	2,002.41	<u>3,002.41</u>	
Unpaid Labor.....		3,087.58	
Unpaid Purchases.....		43.35	<u>14,395.21</u>

December 1, 1912, Balance..... \$ 8,831.52

MORGAN COUNTY.**Receipts.****State Appropriations—**

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	4,444.45	
1911 Bond Issue.....	10,000.00	\$16,444.45

County Appropriations—

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,000.00		
1910 Special Road Tax (amount reported collected).....	1,012.00		
1911 Special Road Tax (amount reported collected).....	4,322.04		
1912 Special Road Tax (based on valuation).....	4,409.84	11,243.88	\$27,688.33

Disbursements.**By State Auditor—**

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	13,062.27	\$15,062.27

By County Auditor—

1909 and 1910.....	\$ 1,677.49		
1911 and 1912.....	3,496.16	5,173.65	
Unpaid Labor.....		1,732.30	
Unpaid Purchases.....		258.44	22,226.66

December 1, 1912, Balance.....\$ 5,461.67

PIUTE COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00		\$16,444.44
			<hr/>

County Appropriations—

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,055.55		
1910 Special Road Tax (amount reported collected).....	918.82		
1912 Special Road Tax (based on valuation).....	2,159.98	4,634.35	\$21,078.79
		<hr/>	<hr/>

Disbursements.

By State Auditor—

1901 and 1910.....	\$ 2,000.00		
1911 and 1912.....	8,900.40		\$10,900.40
			<hr/>

By County Auditor—

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,458.54	1,958.54	
		<hr/>	
Unpaid Labor.....		1,512.93	
Unpaid Purchases.....		276.69	14,648.56
		<hr/>	<hr/>
December 1, 1912, Balance.....			\$ 6,430.23

RICH COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issu.....	10,000.00	\$16,444.44	

County Appropriations—

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,121.60		
1910 Special Road Tax (amount reported collected).....	3,724.69		
1911 Special Road Tax (amount reported collected).....	1,981.62		
1912 Special Road Tax (based on valuation).....	6,419.18	13,747.09	\$30,191.53

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,978.39		
1911 and 1912.....	12,403.90	\$14,382.29	

By County Auditor—

1909 and 1910.....	\$ 3,512.70		
1911 and 1912.....	3,282.16	6,794.86	
Unpaid Labor.....		1,489.69	
Unpaid Purchases.....		659.29	23,326.13

December 1, 1912, Balance..... \$ 6,865.40

SALT LAKE COUNTY.**Receipts.**

State Appropriations—			
1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44	\$ 6,444.44	
County Appropriations—			
1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,246.08	6,246.08	\$12,690.52

Disbursements.

By State Auditor—			
1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,193.13	\$ 6,193.13	
By County Auditor—			
1909 and 1910.....	\$ 2,179.59		
1911 and 1912.....	3,465.95	5,645.54	
Unpaid Labor.....		642.25	
Unpaid Purchases.....		2,09.60	12,690.52
December 1, 1912, Balance.....			None

SAN JUAN COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	10,000.00	\$16,444.45	

County Appropriations—

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,000.00		
1911 Special Road Tax (amount reported collected).....	2,906.27		
1912 Special Road Tax (based on valuation).....	2,948.33	7,354.60	\$23,799.05

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 251.86		
1911 and 1912.....	9,415.01	\$ 9,666.87	

By County Auditor—

1909 and 1910.....	\$ 23.85		
1911 and 1912.....	3,198.80	3,222.65	
Unpaid Labor.....		144.00	
Unpaid Purchases.....		376.02	13,409.54

December 1, 1912, Balance.....			\$10,389.51
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SAN PETE COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	10,000.00	\$16,444.45	

County Appropriations—

1909 and 1910.....	\$ 2,020.69		
1911 and 1912.....	4,000.00		
1911 Special Road Tax (amount reported collected).....	687.59		
1912 Special Road Tax (based on valuation).....	24,357.36	31,065.64	\$47,510.09

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	13,411.00	\$15,411.00	

By County Auditor—

1909 and 1910.....	\$ 2,020.69		
1911 and 1912.....	10,871.55	12,892.24	
Unpaid Labor.....		415.09	
Unpaid Purchases.....		724.93	29,443.26

December 1, 1912, Balance.....			\$18,066.83
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SEVIER COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	10,000.00	\$16,444.45	
		<u> </u>	

County Appropriations—

1909 and 1910.....	\$ 1,000.00		
1911 and 1912.....	2,000.00		
1911 Special Road Tax (amount reported collected).....	12,834.84		
1912 Special Road Tax (based on valuation).....	15,779.45	31,614.29	\$48,058.74
		<u> </u>	<u> </u>

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,944.14		
1911 and 1912.....	10,382.62	\$12,326.76	
		<u> </u>	

By County Auditor—

1909 and 1910.....	\$ 1,000.00		
1911 and 1912.....	8,284.51	9,284.51	
		<u> </u>	
Unpaid Labor		3,542.64	
Unpaid Purchases		1,953.90	27,107.81
		<u> </u>	<u> </u>
December 1, 1912,			\$20,950.93

SUMMIT COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	10,000.00	<u>\$16,444.45</u>	

County Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,000.00		
1911 Special Road Tax (amount reported collected).....	19,288.51		
1912 Special Road Tax (based on valuation)	24,186.85	<u>\$49,575.36</u>	<u>\$66,019.81</u>

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,881.01		
1911 and 1912.....	13,846.87	<u>\$15,727.88</u>	

By County Auditor—

1909 and 1910.....	\$ 1,622.35		
1911 and 1912.....	25,304.89	<u>26,927.24</u>	
Unpaid Labor.....		5,339.47	
Unpaid Purchases.....		2,118.62	<u>50,113.21</u>

December 1, 1912, Balance..... \$15,906.60

TOOELE COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	10,000.00	\$16,444.45	

County Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,000.00		
1910 Special Road Tax (amount reported collected).....	3,905.07		
1911 Special Road Tax (amount reported collected).....	10,521.13		
1912 Special Road Tax (based on valuation).....	4,827.51	25,253.71	\$41,693.16

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,935.47		
1911 and 1912.....	8,381.62	\$10,317.09	

By County Auditor—

1909 and 1910.....	\$ 2,889.75		
1911 and 1912.....	5,504.78	8,394.53	
Unpaid Labor.....		1,759.00	
Unpaid Purchases.....		559.83	21,030.45

December 1, 1912, Balance.....			\$20,667.71
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UINTAH COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	<u>10,000.00</u>		\$16,444.45

County Appropriations—

1909 and 1910.....	\$ 750.00		
1911 and 1912.....	2,000.00		
1911 Special Road Tax (amount reported collected).....	2,073.92		
1912 Special Road Tax (based on valuation).....	<u>2,248.68</u>	<u>7,072.60</u>	\$23,517.05

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,521.15		
1911 and 1912.....	<u>9,858.51</u>		\$11,379.66

By County Auditor—

1909 and 1910.....	\$ 592.43		
1911 and 1912.....	<u>3,035.23</u>	3,627.66	
Unpaid Labor.....		1,402.00	
Unpaid Purchases.....		<u>378.79</u>	<u>16,788.11</u>

December 1, 1912, Balance.....			\$ 6,728.94
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UTAH COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	4,444.45	
1911 Bond Issue.....	10,000.00	\$16,444.45

County Appropriations—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	4,000.00	
1911 Special Appropriations....	18,000.00	24,000.00
		\$40,444.45

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 2,000.00	
1911 and 1912.....	12,872.65	\$14,872.65

By County Auditor—

1909 and 1910.....	\$ 1,957.68	
1911 and 1912.....	16,468.04	18,425.72
Unpaid Labor.....	5,951.63	
Unpaid Purchases.....	18.70	39,268.70
December 1, 1912, Balance.....		\$ 1,175.75

WASATCH COUNTY.**Receipts.**

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	<u>10,000.00</u>	\$16,444.45	

County Appropriations—

1909 and 1910.....	\$ 1,000.00		
1911 and 1912.....	2,853.34		
1911 Special Road Tax (amount reported collected).....	936.57		
1912 Special Road Tax (based on valuation).....	<u>3,330.26</u>	<u>8,120.17</u>	\$24,564.62

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,992.50		
1911 and 1912.....	<u>13,677.05</u>	\$15,669.55	

By County Auditor—

1909 and 1910.....	\$ 1,853.34		
1911 and 1912.....	<u>1,975.29</u>	3,828.63	
Unpaid Labor.....		667.02	
Unpaid Purchases.....		<u>1,674.84</u>	<u>21,840.04</u>

December 1, 1912, Balance.....			\$ 2,724.58
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WASHINGTON COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.44		
1911 Bond Issue.....	10,000.00	\$16,444.44	

County Appropriations—

1909 and 1910.....	\$ 581.89		
1911 and 1912.....	500.00		
1911 Special Road Tax (amount reported collected).....	539.06		
1912 Special Road Tax (based on valuation).....	3,225.00	4,845.95	\$21,290.39

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,999.90		
1911 and 1912.....	6,847.04	\$ 8,846.94	

By County Auditor—

1909 and 1910.....	\$ 581.89		
1911 and 1912.....	24.25	606.14	
Unpaid Labor.....		1,869.13	
Unpaid Purchases.....		1,644.86	12,967.07

December 1, 1912, Balance..... \$ 8,323.32

WAYNE COUNTY.

Receipts.

State Appropriations--

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	10,000.00	\$16,444.45	
		<u> </u>	

County Appropriations--

1909 and 1910.....	\$ 500.00		
1911 and 1912.....	1,055.55		
1911 Special Road Tax (amount reported collected).....	1,560.83		
1912 Special Road Tax (based on valuation).....	1,593.44	\$ 4,709.82	\$21,154.27
		<u> </u>	<u> </u>

Disbursements.

By State Auditor--

1909 and 1910.....	\$ 787.80		
1911 and 1912.....	9,963.07	\$10,750.87	
		<u> </u>	

By County Auditor--

1909 and 1910.....			
1911 and 1912.....	2,360.72	2,360.72	
		<u> </u>	
Unpaid Labor.....		1,314.50	
Unpaid Purchases.....		484.56	14,910.65
		<u> </u>	<u> </u>
December 1, 1912, Balance.....			\$ 6,243.62

WEBER COUNTY.

Receipts.

State Appropriations—

1909 and 1910.....	\$ 2,000.00		
1911 and 1912.....	4,444.45		
1911 Bond Issue.....	10,000.00	\$16,444.45	

County Appropriations—

1909 and 1910.....	\$ 2,340.26		
1911 and 1912.....	4,000.00		
1911 Special Road Tax (amount reported collected).....	10,353.88		
1912 Special Road Tax (based on valuation).....	3,820.53		
Paid by County.....	1,194.33	21,709.00	\$38,153.45

Disbursements.

By State Auditor—

1909 and 1910.....	\$ 1,999.99		
1911 and 1912.....	13,719.47	\$15,719.46	

By County Auditor—

1909 and 1910.....	\$ 2,340.26		
1911 and 1912.....	18,922.84	21,263.10	
Unpaid Purchases.....		195.90	37,178.46
December 1, 1912, Balance.....			\$ 974.99

SUMMARY SHOWING APPROPRIATIONS AND EXPENDITURES BY COUNTIES.
1909—1912.

COUNTY.	APPROPRIATIONS.			Expenditures.	Balance
	State Appropriations.	County Appropriations.	Total Appropriations.		
Beaver	\$16,444.44	\$19,413.19	\$35,857.63	\$28,029.68	\$ 7,827.95
Box Elder	16,444.44	39,284.63	55,729.07	36,172.30	19,556.77
Cache	16,444.44	19,291.48	35,735.92	27,080.94	8,654.98
Carbon	16,444.44	15,663.04	32,107.48	25,897.74	6,209.74
Davis	16,444.45	49,578.61	66,023.06	49,776.84	16,246.22
Emery	16,444.44	13,932.96	30,377.40	24,264.91	6,112.49
Garfield	16,444.44	2,237.23	18,681.67	15,313.06	3,368.61
Grand	16,444.44	11,780.16	28,224.60	16,458.37	11,766.23
Iron	16,444.44	17,392.45	33,836.89	16,299.84	17,537.05
Juab	16,444.44	18,781.36	35,225.80	31,651.29	3,574.51
Kane	16,444.44	5,687.05	22,131.49	11,325.98	10,805.51
Millard	16,444.44	6,782.29	23,226.73	14,395.21	8,831.52
Morgan	16,444.45	11,243.88	27,688.33	22,226.66	5,461.67
Piute	16,444.44	4,634.35	21,078.79	14,648.56	6,430.23
Rich	16,444.44	13,747.09	30,191.53	23,326.13	6,865.40
Salt Lake	6,444.44	6,246.08	12,690.52	12,690.52	10,389.51
San Juan	16,444.45	7,354.60	23,799.05	13,409.54	18,066.83
San Pete	16,444.45	31,065.64	47,510.09	29,443.26	20,950.93
Sevier	16,444.45	31,614.29	48,058.74	27,107.81	15,906.60
Summit	16,444.45	49,575.36	66,019.81	50,113.21	20,667.71
Tooele	16,444.45	25,253.71	41,698.16	21,030.45	6,728.94
Uintah	16,444.45	7,072.60	23,517.05	16,788.11	1,175.75
Utah	16,444.45	24,000.00	40,444.45	39,268.70	2,724.58
Wasatch	16,444.45	8,120.17	24,564.62	21,840.04	8,323.32
Washington	16,444.44	4,845.95	21,290.39	12,967.07	6,243.62
Wayne	16,444.45	4,709.82	21,154.27	14,910.65	974.99
Weber	16,444.45	21,709.00	38,153.45	37,178.46	
Totals	\$434,000.00	\$471,016.99	\$905,016.99	\$653,615.33	\$251,401.66

SALARY OF CHIEF CLERK AND CONTINGENT EXPENSE.

Appropriation	\$4,000.00
Amount paid out of this fund by State Auditor.....	<u>1,668.35</u>
December 1, 1912, Balance.....	\$2,331.65

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[The body of the document contains several lines of text that are extremely faint and illegible. The text appears to be a list or a series of entries, but the specific content cannot be discerned.]

LIST OF DRAWINGS SHOWING DESIGN OF

Road Harrow.

Inverted Syphon.

Concrete Culverts for Millard County.

Concrete and Rock Culverts for Rich County.

Concrete Culvert over Hyrum Slough, Cache County.

Twenty-foot Concrete Bridge over Canal, Morgan County.

Bridge over East Fork of Virgin River, Kane County.

Bridge over Johnson Wash, Kane County.

Bridge over Virgin River, Kane County.

Bridge over North Fork of Dry Gulch, Wasatch County.

Standard Plan 40-foot Steel Riveted Truss.

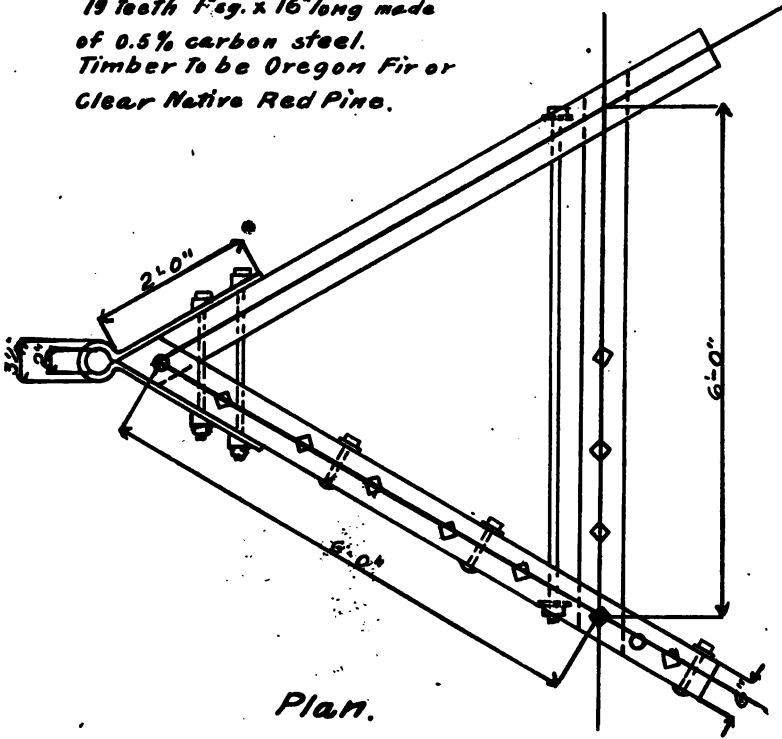
Bridge over Provo River above Heber, Wasatch County.

Bridge over Sevier River, Sevier County.

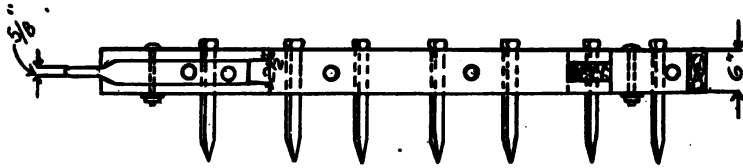
Sprinkling System for State Road, Davis County.

MAP OF STATE ROADS.

Note:-
 19 teeth 1" sq. x 16" long made
 of 0.5% carbon steel.
 Timber To be Oregon Fir or
 Clear Native Red Pine.



Plan.

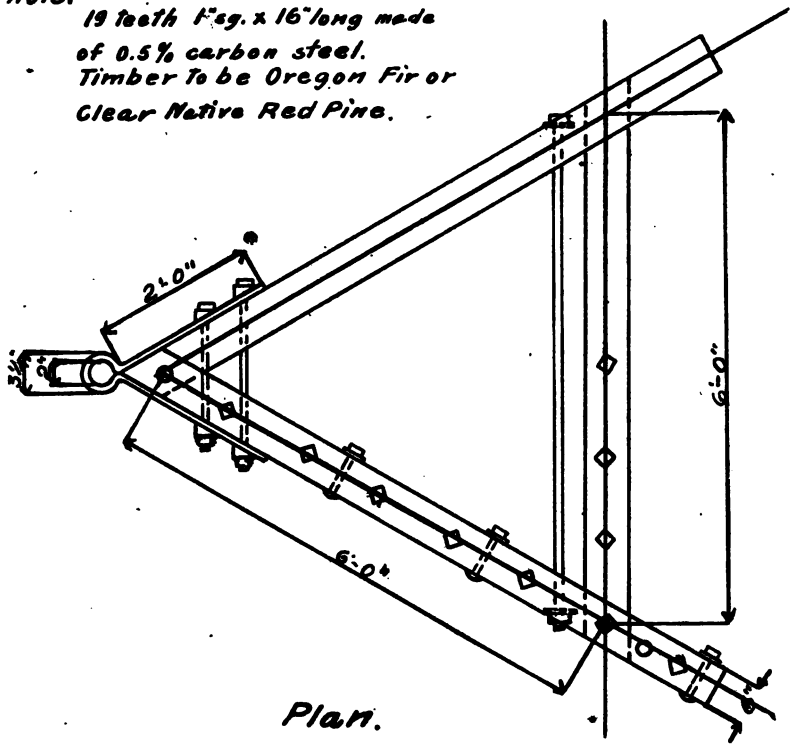


Elevation.

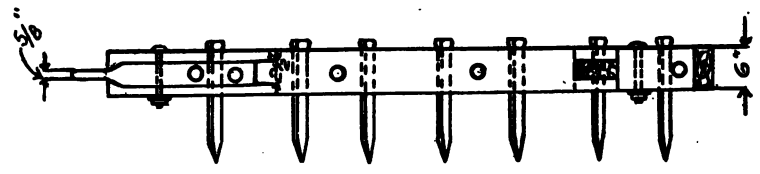
UTAH STATE ROAD COMMISSION, <i>Design</i> of ROAD HARROW.	
<i>W. B. Sears, State Road Engineer.</i> <i>Salt Lake City, Utah.</i>	
Designed by <i>W. B. Sears</i> Drawn by <i>S. G. G.</i> Checked by Approved by	Scale $\frac{1}{4}'' = 1 \text{ Ft.}$ Issued <i>5-29-1916</i> From <i>Salt Lake City</i>
9-4-21	

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PUBLIC LIBRARY
ASTOR, LENOX AND
TILDEN FOUNDATIONS.

Note:-
 19 teeth 1" sq. x 16" long made
 of 0.5% carbon steel.
 Timber To be Oregon Fir or
 Clear Native Red Pine.



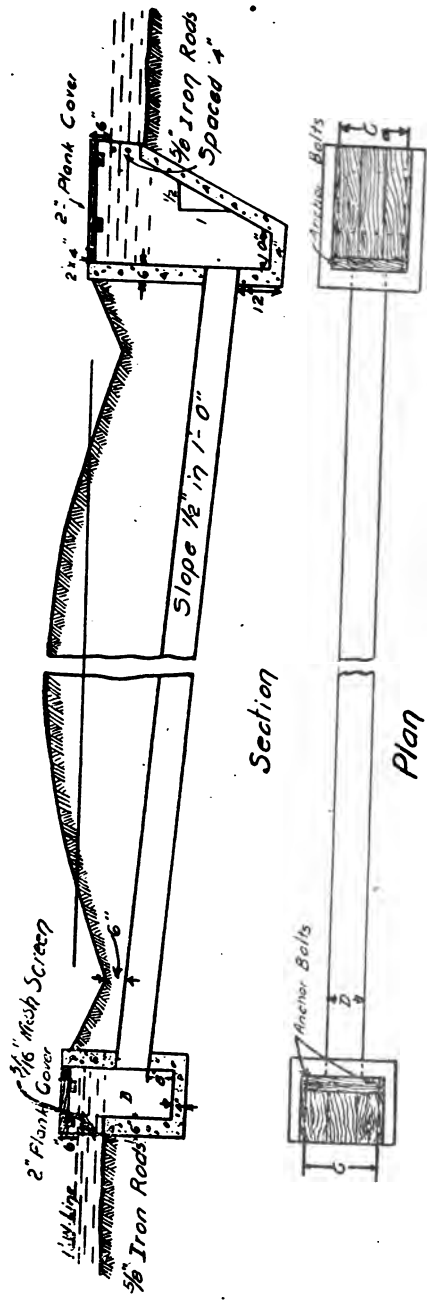
Plan.



Elevation.

UTAH STATE ROAD COMMISSION, <i>Design</i> of ROAD HARROW.	
<i>W. D. Beers, State Road Engineer.</i> <i>Salt Lake City, Utah.</i>	
Designed by <i>E. J. Larson</i> Drawn by <i>S. J. Allen</i> Checked by Approved by	Scale $\frac{1}{2}'' = 1 \text{ Ft.}$ Issued <i>5-24-06.</i> From <i>Salt Lake City.</i>
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Note: All Pipe used
Shall be either
Concrete or Vitrified.

D - Diameter of Syphon	B	C
10"	18"	24"
12"	18"	24"
15"	24"	30"
18"	24"	30"
20"	30"	36"
24"	30"	36"

UTAH STATE ROAD COMMISSION
 Design of Inverted Syphon
 Ditches Crossing State Highway
 W. B. Evans, State Road Engineer, Salt Lake City, Utah.

Designed by: W. B. Evans
 Drawn by: W. B. Evans
 Checked by: W. B. Evans
 Approved by: W. B. Evans

Scale: 1/4" = 1'-0"
 Issued: 3-1-1919
 From: Salt Lake City, Utah

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Vertical line of dots on the left side.

Three short, slanted lines in the center.

Vertical line of dots on the right side.

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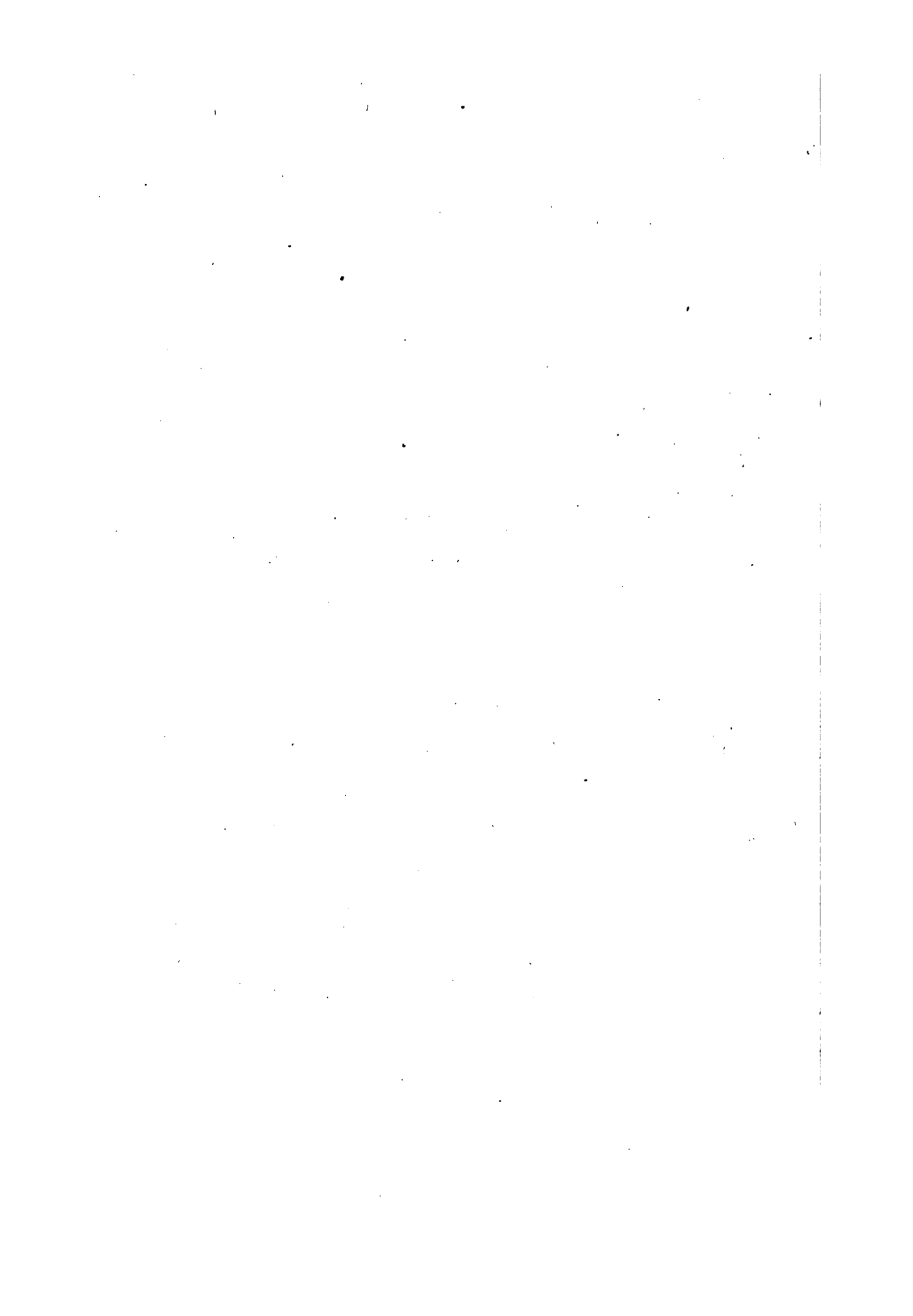
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